American Journal of Obstetrics and Gynecology

VOL. XXII ST. LOUIS, SEPTEMBER, 1931 NO. 3

Original Communications

THE UNIFICATION OF SCIENCE AND ITS RELATION TO THE CONTROL OF LIFE*

BY WILLIAM P. GRAVES, M.D., BOSTON, MASS.

THE ultimate goal of pure science is the complete unification of all the laws of nature into a single principle which shall explain the phenomena both of living and nonliving matter. The goal of applied science is to utilize the knowledge thus gained in ways that may benefit the human race. The purpose of this paper is, first to sketch briefly the more important steps by which pure science has reached its present stage on the road toward unification; second, to show how the new knowledge of physics and chemistry is being applied to the study and control of life processes; and third, to draw certain conclusions relative to the conduct of medical education and practice.

THE DEVELOPMENT OF NATURAL SCIENCE

To the Greeks, chiefly, we owe the beginnings of natural science, for they were the first of primitive people to recognize that the mysteries of nature are directed not by gods and demons, but by definite discoverable laws. Though, in comparison with their priceless contributions to art and literature, they added little of permanence to practical science, their deductive method of reasoning led them to many conclusions of amazing accuracy. Thus they described the rotation of the earth and the solar system, and explained the cycle of the seasons. They even calculated the earth's circumference and predicted an eclipse of the sun in 500 B.C. In the first attempts to reduce nature to its simplest terms, Democritus conceived the atomic theory

*Presidential Address, presented at the Fifty-Sixth Annual Meeting of the American Gynecological Society, Hot Springs, Va., May 19, 1931.

NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

and Heraclitus described the eternal flux of matter, both in harmony with modern empirical knowledge. While Thales expressed a belief in the essential unity of nature in 600 B.C.

But the Greeks were ignorant of the experimental method and their wonderful deductions were sterile and soon forgotten. Some of their speculations actually hindered the progress of scientific thought. Aristotle, accepted for centuries as the arbiter of science, obscured the knowledge of physics to the time of Galileo by his unaccountable blunders regarding physical laws. Plato's dual philosophy of spirit and matter, beautiful though it was, sowed the seeds of that religious intolerance which completely obstructed science through the Middle Ages and hampered it until recent times.

The inspiring theory of the unity of nature, proclaimed by the great philosophers of the Greek period, was later developed by the famous Roman poet Lucretius in his poem "De Rerum Naturae." But his unitarian ideas were soon displaced by the Christian dogmas, and until the present century he has been generally regarded as the unholiest of all pagan philosophers.

Modern physical science was born early in the seventeenth century when Galileo established the experimental method as the basis of determining natural laws. His invention of the telescope made possible the discoveries of Newton, Kepler and Laplace in the following generation, by which the laws of mass, inertia, motion, and gravitation were correlated for the entire universe and supposedly fixed for all time. The estimation of the velocity of light by Roemer and the conception by Huyghens of a luminiferous ether paved the way for many of the triumphs of the nineteenth and twentieth centuries.

The discoveries in the field of electricity constituted the greatest step of all toward a solution of the unity of nature, for thereby was revealed the force which present-day science has proved to be the basic principle of all matter whatsoever.

The nineteenth century abounded in examples of scientific unification. Heat, long supposed to be a separate entity and called "caloric" or "phlogiston" was shown to be a form of energy, which in turn was proved to be an inseparable property of mass. These discoveries led to the great Law of the Conservation of Energy, called by modern scientists the most far-reaching physical principle ever developed. During the brilliant succession of Oersted, Faraday, Maxwell and Hertz, electricity and magnetism were discovered to be interconvertible phases of an identical force, and the same force, electro-magnetism, was identified with the phenomena of light.

Chemistry, the belated offspring of the chaotic alchemy of the Middle Ages, came into its own in the nineteenth century. The discovery of the Periodic Law of the elements and the revelation of new

elements by the spectroscope established the structural unity of the universe. The experiment of Wöhler in 1828 by which he succeeded in synthesizing urea, a product of living matter, broke down the old distinction between organic and inorganic chemistry based on the presence or absence of life and prepared the way for a fusion of the two into a single science.

Toward the close of the nineteenth century the exciting events of new discovery and correlation had come to an end and it was generally believed that the knowledge of natural science was well-nigh complete. It was at this moment of fading enthusiasm that the discoveries of the x-rays and radioactivity revealed the subatomic nature of matter, and a new era was ushered in, which has advanced science a long way toward its unitarian goal.

It would be audacious of me to attempt to expound the present rapidly changing theories of natural science, many of which can be understood only by specially trained minds. But there are certain new concepts, already familiar to you, which must be mentioned in order to complete my thesis of the convergent trend of science.

The ultimate atom of Democritus and Lucretius was shown by Dalton to be not an atom at all in the literal sense but a complicated molecule made up of smaller and supposedly indivisible particles combined in numerical proportions. Nearly a century later radioactivity proved Dalton's atom to be complex and to consist of a positively charged nucleus, or proton, surrounded by negatively charged electrons, the number of which determines the physical properties of the element. In the great search for the ultimate, the electron is at the present moment the last word of indivisibility—but even on this, doubt has already been cast.

The century-old theory of Prout that the hydrogen atom is the building-block unit from which all other elements are constructed has been recently proved beyond contention. Thus the dream of the alchemist of a primeval element has at last been realized.

The greatest achievement of the nineteenth century had been the correlation of all natural forces into the two separate concepts of mass and energy. Probably the greatest event of the twentieth century has been the identification of mass and energy, mathematically proved by Einstein in 1907. Matter is thus shown to be a collection of electrical charges. Hence, as Jeans puts it, "All the sciences which deal with the properties and structure of matter, have with one turn of the kaleidoscope become ramifications of the single science of electricity."

Einstein has further identified inertia and gravitation and hopes eventually to link them with electro-magnetism. The theory of relativity has led to the fusion of space and time as a single inseparable concept. Furthermore, mass has been described as a crumpled in-

equality of space and time. Space is asserted to be finite and is being measured by a new non-Euclidian geometry that requires a fourth dimension. Geometry is being fused with physics. Eddington says, "An ideal shines in front of us, far ahead perhaps but irresistible, that the whole of our knowledge of the physical world may be unified into a single science which will perhaps be expressed in terms of geometrical or quasi-geometrical conceptions." And again the same author makes this pregnant statement: "There is no reason to regard the partitions of the sciences made in the early stages of human thought as irremovable."

Many of the new discoveries may be understood without any serious change in the routine processes of thought. But the relativity and quantum concepts require an intellectual reversal similar to that produced by the announcements of Copernicus and Darwin.

The theory of relativity, excepting in its elementary phases, reaches beyond the mental scope of the ordinary individual, unaccustomed to think in terms of the higher mathematics, so that many of its deductions seem puzzling and even paradoxical. But the quantum theory is more comprehensible and touches the thinking man in an intimate way. I shall therefore pause to consider it, as it has a certain indirect bearing on the argument of this discourse.

The quantum theory, originated by Planck and mathematically proved by Bohr and Einstein and others, asserts the *discontinuous* or *granular* nature of energy; that is to say, energy does not flow in a continuous stream but is emitted in a series of jumps or quanta, the stimulus of each one of which, is a chance atomic disturbance. In stable matter the discharge results from the influence of some external force. In radioactive substances it is due to the chance spontaneous decay of individual atoms. I shall not attempt to discuss the immense importance which the quantum theory is having in solving the problems of the new science of wave-mechanics. I shall speak only of its relation to a philosophical problem which has troubled the mind of man since time immemorial. If the element of chance enters into nature's most fundamental function, i.e., the transmission of energy, it is evident that the doctrine of a mechanistic world, predetermined and inexorable, is shattered, and with it the argument, hitherto unanswerable, against the freedom of the will. Kant in his philosophy included freedom with God and immortality as the three central mysteries of the supersensual world, knowable but not provable. The quantum theory permits us to take freedom from the realm of mystery, and correlate it with the proved laws of physics, an important step toward the monism of physics and psychology that has long been predicted.

Finally, it must be noted that physics and chemistry are rapidly losing their dividing line and must eventually be fused into a single

science. They are now merely chapters of a single book to which other chapters will be added as the various branches of science become simplified and blended in terms of a common principle.

THE CONTROL OF LIFE

When one contemplates the achievements of the great masters of pure science and the prodigious mechanical triumphs of applied science, the thought at once occurs, why have not similar results been attained in the realm of living matter? The question is especially pertinent to us whose daily task is a combat against the natural enemies of life, in which we are only too often the losers. Our next inquiry, therefore, relates to what is known of that special property of matter which we call life, and to what part applied science is playing in its control.

And first we must ask, what is life? It is evident that life, as we know it on this globe, is an extraordinary event in the evolution of the universe. It is possible, and some think even probable, that life, at least in its highest manifestation of reasoning human beings, exists at the present time only on the astronomical speck of matter which we call the earth. Speculation as to the purpose of life is well summed up by Sir James Jeans, who asks "whether it is a final climax toward which the creation moves. Or is it a mere, and possibly quite unimportant, by-product of natural processes, with some other stupendous end in view? Or is it of the nature of a disease which affects nature in its old age? Or is it the only reality which creates, instead of being created by, the colossal masses of the stars and nebulae, and the almost inconceivably long vistas of astronomical time?"

But to us as physicians speculation as to the purpose of life is of minor importance. We are concerned with the grim facts of life, and with devising means to combat certain physical ills that beset it from its beginning to its end.

The modern scientist no longer ascribes to living matter a mysterious and inscrutable "vital principle" which for a time pervades or is imposed upon matter. He assumes, on the contrary, that life is a natural phenomenon that obeys the physical laws prevailing elsewhere in the universe. Jeans regards life as a property of matter analogous to magnetism and radioactivity. Just as magnetism is determined by the number of planetary electrons of iron, and radioactivity by the subatomic structure of decaying uranium, so life is dependent upon the individual electronic make-up of the carbon atom. The scientist makes no pretense of explaining the ultimate nature of life any more than he does that of magnetism and radioactivity or of electricity, but he reasons that life, like the other forces of nature, is a convertible form of energy which he hopes finally to command for the everlasting benefit of mankind. That he has not already done so is due to the immense

complexity of the molecule of living matter, which is so intricate and subject to such constant variation that it has so far defied analysis.

It is sufficiently evident that the vital processes of living organisms represent chemical transformations of matter from birth to death. Conception itself is a chemical reaction, as has been proved by the biologists, who by chemically treating the unfertilized eggs of sea urchins and frogs are able not only to repeat early cell-division but to carry the organisms through the complex stages of growth to maturity. The human body is a vast chemical laboratory on which depend the functions of digestion, respiration, secretion, elimination, muscular action, the emotions, and probably conscious thought itself. Death is an overwhelming chemical change in the colloidal substance of the body. Diseases that are not of a purely mechanical nature are all the result of chemical changes. Infectious diseases result from the toxic growth of parasitic organisms. Functional diseases are due to deficiency or overproduction of natural secretions by which the delicate balance of the body-chemistry is upset. Cancer is the reaction of living cells to long-continued chemical irritation; and so on to the end of the list.

The concept of life in all its aspects as a series of chemical reactions is, of course, not new, but it has been enormously developed by the newly acquired knowledge of physical chemistry. It is therefore proper to designate the present as the Chemical Age of medicine, since it can be shown that all branches of medical science are, in their progressive aspects, tending toward a common physicochemical goal.

Man has always, knowingly or unknowingly, looked to chemistry for a cure of his physical ills. The herbs of primitive people occasionally hit the scientific mark, as in the case of cinchona. The murderous alchemy of the Middle Ages resulted from a frenzied search in nature's store for the great panacea. In premodern days there was an immense pharmacopeia, feeble for the most part and containing only two or three specific drugs that had been discovered by accident. Then Lister introduced the principle of antisepsis and Pasteur founded the far-reaching science of immunology. In more recent times chemistry, aided by the new laws of physics, has had many triumphs. Synthetic chemistry has given us such remedies as Ehrlich's 606 and the products of coal tar. Physiologic chemistry has given us the liver cure for pernicious anemia, one of the most astonishing of all specific remedies.

To chemistry and physiology we owe not only the isolation of many of the internal secretions of the body, but the actual synthesis of some of them, whereby the therapeutic value of the natural extract is exceeded. In this way the whole science of endocrinology, for a time looked upon askance by the general profession, is now on a solid experimental basis and offers a boundless field for future research.

Another chemical triumph is the discovery of the vitamins, a new field that promises to have an immense influence in regulating the health of the race. At the present time the subject is largely veiled in mystery. Most significant is the production of vitamin D by ultraviolet irradiation, a striking illustration of the convergence of physics and chemistry. Sperti, in a recent work, applied the quantum theory of radiation to a study of vitamin D and obtained a product of new potency by a proper selection of the wave-lengths of light.

The foregoing are only a representative few of innumerable instances in which the laws of chemistry and physics are being employed in the general treatment of disease.

But let us carry the matter further and inquire how certain of the special branches of medicine stand in relation to the basic sciences.

Anatomy reached its peak many years ago and with the advent of the microscope evolved into histology and embryology. Embryology matured in turn and has now become, in its progressive phase, an experimental science closely associated with biology and genetics. Its remarkable achievements in transforming life at its source are based on chemical changes.

Histologic pathology, fathered by Virchow and developed for half a century by able investigators, has well-nigh exhausted its original morphologic field and is now turning to the study of cell-function. Bacteriology is reaching the limit of microscopic research and is now chiefly concerned with the biochemistry of immunology. Genetics, the youngest of the biological sciences, is not yet generally included in medical curricula, but it promises some time to occupy a position of supreme importance. Based on immutable natural laws and speeded up by modern methods of research, genetics has in the short space of thirty years attained the distinction of an exact science. It has accurately "analyzed the phenomena of heredity and development in terms of matter." Its industrial application now governs plant culture and the breeding of domestic animals. It has added much to the knowledge of constitutional diseases, especially that of cancer. And, finally, it has demonstrated in a dramatic way possibilities in the mastery of life that tax the most vivid imagination.

The geneticist has traced the source of heredity characters to the complicated molecule of the genes of the chromosomes. And here he also stops and is calling on physical chemistry to solve the problems of future progress by unlocking the tiny chamber that conceals the most mysterious of all the secrets of life.

The subject of Radiant Energy is perhaps the most important field of all human research at the present time, covering as it does a study of the entire universe from the limits of space to the smallest unit of subatomic matter. Nor is it of interest only to the great men of pure

science, for it promises to have a most intimate bearing on human welfare. The dependence of life-nourishment on the radiance of the sun has long been understood. The physiologic effects of ultraviolet light have been revealed and put to beneficent use. X-radiation and the radioactivity of metals are now an incalculable boon to medicine in diagnosis and the treatment of disease. And yet all this is probably the merest beginning.

The cosmic rays, which but a short time ago seemed an extravagant myth, are already a comprehensible reality. Having their source in the vast interstellar spaces beyond the nebulae of the Milky Way, and independent of the sun, these rays are of such incredible hardness (their frequency is one hundred million times that of visible light) that they can penetrate eighteen feet of lead, two hundred feet of water, and seven hundred feet of earth. Here is a newly discovered force of nature which man will eventually harness and utilize. Already speculation is rife as to the part these rays may play in the chemistry of life and death, a problem which must be solved by the men of science.

To us, as gynecologists and obstetricians, the status of surgery in the present reformation of medical science is of particular interest. Surgery has always been in many ways a detached branch of medicine. It is obviously not a science in the strict sense of the word. Some have attempted to include it among the fine arts, but such a notion requires too great a stretch of the imagination. Operative surgery is essentially a craft, requiring for its routine performance no high degree of technical talent nor great intellectual endowment; hence the early surgeon occupied a somewhat lowly position among the medical fraternity. But the advent of anesthesia and antisepsis raised surgery to a noble calling which rapidly acquired an incomparable power of saving and prolonging life. During the period of technical exploration the surgeon of daring ingenuity held the center of the medical stage. But that period is waning. Lord Moynihan, in a recent address, emphasized that surgery is reaching the limits of technical possibilities and is now turning for progress to the study of function. The same idea has been expressed by Ward, Mayo, Whitridge Williams, and others. Modern operative surgery, therefore, is also becoming a servant of science. Its present eminence was created by the sciences of chemistry and bacteriology and on science it will depend for its future progress.

CONCLUSIONS

The great advance of science and its rapid application in the form of mechanical invention has filled many timid souls with dismay. Some think that man has created a sort of Frankenstein that will one day turn and destroy him. Some, like Oswald Spengler, discern in the

Machine Age a decadence of civilization. The New Humanist cult see in it a devastating materialism that is ruining culture, and they urge a return to classical standards of thought and living.

Most people, however, believe that the Machine Age is raising humanity to a higher level of physical and cultural existence, while the medical profession sees in it a supreme opportunity for bettering the health and quality of the race.

The unification of the sciences means their simplification, and there is no doubt that in the more or less distant future a real knowledge of science will be the common heritage of all educated people. In the meantime, for the medical man above all, education in basic science including mathematics is becoming more and more imperative—one that must be early, thorough, and broadly comprehensive. And to theoretic knowledge must be added training in experimental research.

But no plea is necessary for a scientific reformation of medicine, for that movement began with Lister and Pasteur and is now pursuing an irresistible course. The same unification which we have seen apparent in all phases of science is taking place in medical education and practice. The old partition between the clinic and the laboratory has been completely removed. The old antagonism between clinician and laboratory man is dying and the two, though not yet entirely unified, are at least mutually coordinated. And in this union the laboratory worker has the upper hand, for where the great clinician cures his thousands the great researcher cures his tens of thousands. If the young clinician resents this situation, the only answer must be, "Become, then, a researcher yourself." It is a fallacy to think that the successful investigator must be born, not made. The same was once said of surgeons. And it is precisely this combination in the same individual, of science and practice, that is more and more being demanded in the clinical appointments of hospitals and medical schools.

The present problems of the vanishing family doctor and the flourishing specialist that are vexing the public will in time be solved by a multiplication of hospitals and clinical groups, properly spaced and manned by experts; an inevitable outcome of the public demand for the best medical service—a demand in which the poor are even more insistent than the rich.

And attached to these medical centers must be laboratories; not those of the old-fashioned kitchenette type, but big laboratories, teeming with busy young men; both those who are devoting their lives to research and those who are preparing themselves for the up-to-date practice of medicine or surgery.

If this sounds too idealistic, listen to the famous message of the great Pasteur, who said: "Take interest, I implore you, in those sacred dwellings which one designates by the expressive term: Laboratories.

Demand that they be multiplied, that they be adorned; these are the temples of well-being and of happiness. There it is that humanity grows greater, stronger, better," for, as he says elsewhere, "Science is the soul of prosperity of nations and the living source of all progress."

REFERENCES

Abbott: Flatland, 1929, Little, Brown & Co. *Bent:* Machine-Made Man, 1930, Farrar and Rhinehart. *Berthoud:* The New Theories of Matter and the Atom, 1924, Macmillan. The Chemical Foundation: Chemistry in Medicine, 1929. The Chemical Foundation: The Future Independence and Progress of American Medicine. *Darrow:* The New World of Physical Discovery, 1930, Bobbs-Merrill. *Darrow:* The Study of Chemistry, 1930, Bobbs-Merrill. *Eddington:* The Nature of the Physical World, 1930, Macmillan. *Eddington:* Space, Time and Gravitation, 1929, Cambridge University Press. *Gaskell:* What Is Life? 1928, Chicago University Press. *Haeckel:* The Riddle of the Universe, 1900, Harpers. *Haeckel:* The Wonders of Life, 1905, Harpers. *Hamilton:* The Greek Way, 1930, W. W. Norton & Co. *Heyl:* The Frontiers of Physics, 1930, D. Appleton & Co. *Heyl:* The Fundamental Concepts of Physics in the Light of Modern Discovery, 1926, Williams & Wilkins. *Jeans:* The Mysterious Universe, 1930, Macmillan. *Jeans:* The Universe Around Us, 1929, Macmillan. *Koppanyi:* The Conquest of Life, 1930, Appleton. *Lull:* The Ways of Life, 1925, Harpers. *MacKaye:* The Dynamic Universe, 1931, Scribner. *Morgan:* Experimental Embryology, 1927. *Pupin:* The New Reformation, 1927, Scribner. *Russell:* The A B C of Relativity, 1925, Harpers. *Slosson:* Easy Lessons in Einstein, 1920, Harcourt Brace & Co. *Spengler:* The Decline of the West, 1926, Knopf.

Tarlo, B. S., and Olerskaja, N. N.: Determination of the Chloride in Perspiration in Connection with the Total Body Saline Content. Zentralbl. f. Gynäk. **54**: 797, 1930.

The authors believe that one must consider the chloride content of the perspiration, as well as that of the blood and urine, when studying patho-physiologic changes in the body during pregnancy. They feel also, that the skin plays an important rôle in the total salt excretion of the body. Consequently, they undertook to make estimations of the chloride content of the blood, urine, and perspiration, paying particular attention to the latter, during normal and toxemic pregnancies. Method: An electric light bath was used. The skin area to be tested was cleansed with distilled water and then dried. Filter paper was used to take up perspiration. Sweat droplets were blotted, care being taken to see that the paper did not touch the skin. The paper was weighed carefully before and after blotting, and the chloride was estimated by titrating against silver nitrate solution. Bang's micro method was used for blood, and urine was tested by Mohr's technic. The average chloride content of perspiration during the first half of pregnancy was 485 mg. per cent. In general it was found that the values fell with the duration of pregnancy, until during the latter part of gestation the values were about 367 mg. per cent. The lowest values were found in the toxemias of pregnancy, when the chloride content of perspiration reached the low levels of 261 mg. per cent. The curve for urine paralleled that of perspiration. However, the curve for blood did not fall as the pregnancy progressed, but remained elevated, both in the latter part of pregnancy, and in toxemias.

WILLIAM F. MENGERT.

GUM ACACIA IN THE TREATMENT OF ECLAMPSIA

A Preliminary Report

By William J. Dieckmann, B.S., M.D., St. Louis, Mo.

(From the Department of Obstetrics and Gynecology, Washington University School of Medicine and the St. Louis Maternity Hospital)

A CONCENTRATION of the blood is in our experience the most consistent finding in eclampsia and the object of our treatment has been primarily to relieve this condition. I have not been able to find published reports of any conclusive work which deals with this problem. Stander, basing his opinion on blood moisture determinations, states that there is no concentration but if anything a hydremia. We have accumulated sufficient evidence based on blood volume, hemoglobin, cell volume, and serum protein determinations to prove that in eclampsia there is either an absolute or a relative decrease in blood volume. If the hemoglobin, cell volume, and serum protein percentage are greater than normal, the decrease in blood volume is absolute; but if these constituents are higher than the average for that particular period of pregnancy, the decrease in volume is only relative. In either case the magnitude of change in blood volume may be from 500 to 1,500 c.c. These figures are arrived at by determining the blood volume and then calculated daily changes are based on the percentage of increase or decrease of hemoglobin, cell volume, and serum protein. We have a number of determinations in patients with preeclampsia who developed eclampsia and showed this concentration.

Many chemical changes in the blood in eclampsia have been pointed out by numerous investigators but they may be secondary to the concentration. In a concentrated blood because of the increase in cell volume and serum protein, the viscosity is increased and as a result the blood flow through tissues and organs is diminished. Due to the faulty circulation a tissue acidosis is produced and waste products also accumulate in the blood because of decreased volume flow through the kidney. Stander and others have shown that the convulsions (muscular exercise) and anoxemia produce a severe acidosis, due to the accumulation of organic acids, which normally lasts only a few minutes, but if these substances are not removed either by oxidation or excretion by the kidneys or lungs, death may occur. The concentrated blood also has a very short clotting time which predisposes to intravascular thrombosis and undoubtedly plays a part in producing the pathologic lesions found postmortem. Thus we have a classical example of a vicious circle; but, if it can be broken early before there

are marked pathologic changes, there is no reason why the patient should not be cured.

For the past four years we have accumulated both chemical and physical data from the blood of patients suffering from toxemia of pregnancy; and for the past year we have been determining blood volume and also certain physical characteristics of the blood in normal pregnancy. Our purpose is to have a set of normal figures; for, although much of this work has been done previously, its value is questionable either because of imperfect technic in analysis or because of improper methods of obtaining the blood. Furthermore, we believe that the normal changes of pregnancy can only be determined satisfactorily by following a number of women from early pregnancy to the late puerperium.

It is generally accepted that in normal pregnancy there is a true hydremia and that in preeclampsia this hydremia is even more marked. Our studies show that in eclampsia the hemoglobin, cell volume, and serum protein percentage approach or are greater than those of normal pregnancy. This concentration is similar to that seen in shock, intestinal obstruction and severe burns, although the figures may not be so high, and requires similar treatment, namely a procedure which will replace water in the circulation and keep it there.

The most important part of our treatment has been the injection of glucose solution intravenously, and in a previous report we were able to show that in many cases, following such an injection, the dilution or hydration would persist, and usually the patient improved clinically. However, we found that in certain cases, the dilution could not be maintained and in these we advocated delivery preferably from below, but in certain cases cesarean section under local anesthesia. General anesthetics were definitely contraindicated, because they produced changes similar to those found in eclampsia, as shown by Stander's work.

In the past year we have had several patients in whom we could not dilute the blood even after delivery. During and for a short time after the glucose injection there would be a dilution but several hours later, the blood would again be concentrated. Injection of large amounts of glucose over periods of three to seven hours and in one case an additional plasmapheresis were without effect. The explanation, we believe, is that the serum proteins were changed in some way so that they would not hold water. A blood transfusion would not be advisable because of the already high hemoglobin, cell volume, and viscosity. It occurred to us that gum acacia would be an ideal solution to increase the blood volume, because, due to its colloidal properties, it would remain in the circulation, and would hold water. The result would be an increase in blood volume and a decrease in the

viscosity, thereby causing an improvement of the circulation to tissues and organs. These properties had been made use of by Czerny, Erlanger and Gasser, and others in their treatment of shock. We used the gum acacia prepared by Eli Lilly and Company for the treatment of shock.

M. T. (8464) was the first eclamptic patient in whom it was tried as a last resort after all other treatment including plasmapheresis had failed to produce a satisfactory diuresis, dilute the blood or relieve the toxemia as manifested by coma, temperature, etc. Essential data are summarized in Table I. The marked clinical improvement was closely associated with the blood dilution.

E. R. (9601) likewise did not respond satisfactorily to glucose therapy and delivery; and had also been placed on the critical list,

TABLE I.* M. T. No. 8464

DATE	TREATMENT	URINE C.C.	CLINICAL CONDITION T.P.R.	HB. PER CENT	CELL VOL. PER CENT	SERUM PROT. PER CENT	CO_2 VOL. PER CENT	P_H
1930								
6/11 4 P.M.	1000 c.c. 20% Gl.		37.5–140–16	95	42	7.2	37	7.47
	200 M.		Coma					
1 A.M.	1000 c.c. 20% Gl.		Convulsions VI					
Total	2200	2300						
6/12 9 A.M.	1000 c.c. 20% Gl.		39.6–140–36	111	45	7.4	30	7.47
	500 c.c. 10% Gl.		Coma					
2 P.M.	2600 c.c. 10% Gl. in 3 hr.							
7 P.M.	Plasmapheresis 800 c.c.		Plasma-pheresis (Before	105	44	6.8	46	
			(After	95	42	6.7	41	
	4300 c.c. N.T.							
Total	8900	1550						
6/13 9 A.M.	600 c.c. 30% Gl.	26 c.c. in 15 hr.	38.7–172–40	105	45	6.6	45	7.5
5 P.M.	500 c.c. 6% Gum Acacia		Coma					
	500 c.c. 20% Gl.		2 P.M. Stimulants					
11 P.M.	1000 c.c. 20% Gl.		11 P.M.	83	36	4.5	42	
	1000 c.c. N.T.							
Total	3600	450+ in 9 hr.	10 P.M. Recognizes Husband					
6/14	500 c.c. 20% Gl.		38.7–132–36	83	35	5.8	44	
	1900 c.c. N.T.		Improved Conscious					
Total	2400	450+						
6/15	1000 c.c. R.		37.8–108–22					
	1400 c.c. N.T.	125+	Conscious Drowsy					
6/16	3400 c.c. M.	850+	37.6–100–24 Hungry					
6/17	3400 c.c. M.	1000+	37.6–88–24 Uneventful Recovery					
6/18	3600 c.c. M.	1200+	38.3–110–24					
6/21	2700 c.c. M.	950+	37–90–20	77	32	6.3	43	

*Gl., Intravenous Glucose. M., Fluids by Mouth. N. T., Nasal Tube. T. P. R., Temperature, pulse, respirations.

TABLE II. E. R. No. 9601

DATE	TREATMENT	URINE VOL. C.C.	URINE Nacl GM.	T. P. R.	CLINICAL CONDITION	B/P	HB. PER CENT	CELL VOL. PER CENT	SERUM PROT. PER CENT	CO_2 VOL. PER CENT	P_H	A/G RATIO	URIC ACID MGM. PER CENT
10/15	Preeclamptic diet 2200	1100		36–70–20		140/ 98							
10/16	9 P.M. 1000 c.c. 20% Glucose Bag Induction			36–76–18		173/120	95	38	5.5				
	1 A.M. 1000 c.c. 20% Glucose	200			Convulsions II	225/155	101	42	5.6	33	7.45		6.6
	4 A.M. Cesarean section	450			Stupor		122	46	6.1	29	7.37	0.79	7.0
	7 A.M. 1000 c.c. 20% Glucose												
Total	3000 c.c.	1500	3.3										
10/17	1 P.M.				Convulsion Coma-cyanosis								
	5 P.M. 500 c.c. 6% Acacia			37–135–24			125	47	5.8				6.7
	8 A.M. 500 c.c. 20% Glucose					180/140							
Total	3700	2750	4.8										
10/18	10 A.M. 1500 c.c. 20% Glucose 100 c.c. 30% Acacia			37–104–24	Stupor	170/115	91	39	5.6	39	7.47	0.96	
	7 P.M. 500 c.c. 20% Glucose				Conscious								
	10 P.M. 200 c.c. 2% $MgSO_4$; 2000 c.c. 5% Glucose (7 hr.)												
Total	5800	6800	12.9										
10/19	5900	3300	3.3	37–108–24	Much improved	155/ 90			3.8				
10/20	5000	5000	7.5		Uneventful Recovery	145/100	86	34	4.2	60	7.45		3.9
10/21	3900	4800	7.2										
10/22	2600	5500	9.5										
10/23	4200	5100	8.8				77	32	5.2	60	7.4		
10/31							91	36	6.5	55	7.4		
11/ 7							100	41	6.7	56	7.35		
12/ 3							112	44	7.6	59	7.45	1.81	3.1

but after a second injection of acacia, the glucose solution worked satisfactorily and produced a tremendous diuresis coincident with a blood dilution and clinical improvement of the patient. Table II contains data accumulated on this case. There was a decided increase in chloride excretion following the acacia. The serum albumin was also below normal.

Table III illustrates the effect of acacia solution in a severe preeclamptic patient. A marked dilution and increase in chloride excretion can be noted. The effect clinically was almost magical, for within six hours all of the symptoms had disappeared and the patient was relieved for approximately forty-eight hours. Her condition clinically and also the marked blood concentration on admission which was not relieved by glucose solution warranted immediate delivery, but the marked improvement after the acacia tempted us to wait. Her symptoms returned with increased severity and although she was delivered, death occurred thirty minutes after delivery. There was no coma or convulsion, but at autopsy the liver showed the hepatic lesion of eclampsia. Because of its rarity, this case will be reported separately.

M. W. (19540) developed postpartum eclampsia, having 19 convulsions in forty-five hours. After she had been in coma for fifty-one hours and was considered moribund, 200 c.c. of the 30 per cent gum acacia solution were added to 800 c.c. of 10 per cent glucose and in-

TABLE III. I. M. No. 10559

DATE	TREATMENT	URINE VOL. C.C.	URINE NaCl GM.	T. P. R. CLINICAL CONDITION BLOOD PRESSURE	HB. PER CENT	CELL VOLUME PER CENT	SERUM PROTEIN PER CENT	CO_2 VOL. PER CENT	P_H
1931									
2/6	1000 c.c. 20% Gl. 1200 c.c. M.			37–96–20 Headache Drowsy 180/135	125	50	5.8	49	7.47
Total	2200	1400	0.9						
2/7	1000 c.c. 6% Acacia noon 2700 c.c. M. and diet			36.5–82–18 Headache Drowsy 180/135	125	50	6.3 5.7	45	7.4
Total	3700	2700	3.0	6 P.M. Improved					
2/8	2900 M. and diet	2200	2.6	36.7–88–20 Feels fine 180/135	111	39	4.2	45	
2/9	3000 M.	2000	0.6	36.5–88–20 Nausea and vomiting Epistaxis 180/135	105	40	4.1	47	7.45
2/10	500 c.c. 6% Acacia 500 c.c. 20% Gl. Bag induction Delivered			36.5–90–18 Headache 195/160 Died	118	47	5.4	46	7.4

jected. Approximately seven hours later the patient was conscious and able to respond to questions. No studies were made, but because of the marked improvement in a few hours, it seems reasonable to ascribe it to the acacia solution.

In the literature I have been able to find only two references to the use of gum acacia solution in conditions other than shock. Rogers in 1919 stated that after its use in Asiatic cholera, the patient was worse and that death occurred in several moderately severe cases, which would probably have recovered with hypertonic saline solution.

Keith and Walker state that since gum acacia solution is extremely valuable in shock because it restores the blood volume, it should be of value in the treatment of decreased blood volume or dehydration. They felt that Roger's poor results were due to the fact that water was extracted by the acacia from already dehydrated tissues. They injected 80 c.c. per kilo of a 6 per cent acacia solution into normal dogs and into dogs which had been dehydrated by the injection of 50 per cent sucrose solution which was injected over a period of two hours at the rate of 7 gm. per hour for each kilogram of body weight. The hemoglobin at the beginning of the experiment was considered 100 and the average concentration after dehydration was 127 per cent.

In the normal dog they report that the percentage of hemoglobin and hematocrit value of the erythrocytes consistently decreased during an injection of acacia, indicating an increased volume of blood. These values did not return to the initial figures in less than three days. The volume of urine was increased.

In the dehydrated animals, injection of 0.8 per cent NaCl solution caused a rapid return to normal blood volume. However, if they then injected acacia solution, there was a blood dilution which lasted for several hours. If they gave the acacia solution first and then the salt, the dilution persisted for several days. In normal animals and also in those suffering from hemorrhage the tolerance for acacia is approximately 4.8 gm. per kilogram, but in the dehydrated animal the tolerance is much less and death will occur if too much is used. The output of urine after an injection of acacia was always larger than the amount of fluid injected and was also greater than similar amounts of salt or glucose would produce.

Gum acacia in water produces a colloidal suspension, having an osmotic pressure or a water absorbing power and a viscosity, both of which will vary with its concentration. Because the acacia forms a colloidal suspension, it will remain in the circulation for a period of days, will absorb and hold the water. Due to its osmotic pressure, the serum protein percentage will decrease presumably proportionately. Table IV contains data from a patient with nephritis in pregnancy. The dilution was less and the return to normal quicker than in the three eclamptic patients. However, although the volume of urine was not particularly increased, the chloride excretion was more than doubled. This latter property is extremely important because by a judicious use of acacia and glucose solution, which we have demonstrated also causes increased chloride excretion, we should be able to not only reduce the marked edema found so frequently in pregnancy toxemias, but be able to reduce the brain volume and thereby not only

decrease the likelihood of convulsions, but either clear up coma and hyperthermia or prevent their appearance.

TABLE IV. G. R. No. 9501

DATE	INTAKE	URINE VOL. C.C.	URINE GM. NaCl	HEMOGLOBIN PER CENT	CELL VOLUME PER CENT	SERUM PROTEIN PER CENT
12/4	3460	3400	5.1			
5	*2100	2950	12.5	111	40	5.4
6	*2790	3200	10.2	111	40	5.0
7	2650	2750	7.3	105	38	4.5
8	3035	2600	6.5			
9	2925	2100	7.2			
10	3385	925	3.1	125	44	5.7
11	3800	1475	1.1			

*500 c.c. 6 per cent acacia solution.

In eclampsia there is a marked shift of the albumin globulin ratio from the normal of 1.2 to 2.0 to one or less. Since the osmotic pressure of serum albumin is almost four times that of the globulin, it is evident that the osmotic pressure of the serum will presumably be decreased. Many investigators have presented data showing that in certain cases the edema is due to low serum proteins; but in eclampsia with edema we find the height of the diuresis is at the time when the protein concentration is lowest. Undoubtedly other factors are involved. Hartmann has shown clinically that acacia solution will raise the osmotic pressure of a serum low in protein, especially albumin. This is not the only action of the acacia for we have data demonstrating that in addition there are changes in the serum and serum electrolytes as shown by marked differences in surface tension and conductivity.

I hesitate to add anything more to the already varied treatment of eclampsia, but our results were so striking in cases in which heretofore used methods had failed, that we believe it should be given a general trial. We suggest using 500 to 1000 c.c. of a 6 per cent gum acacia solution. Much larger amounts have been given in shock, but the decrease in serum proteins in eclampsia is much more marked than would occur in shock and we do not know how low they can be artificially forced with safety. We have also noted that normally as the proteins decrease, fibrin tends to increase, but following acacia, this apparently is not true. Therefore, it is possible that the fibrin could be decreased to such a degree that either the blood would not clot or if it did, the clot would not be a firm one.

CONCLUSIONS

The principal change in the blood in eclampsia is a concentration, which may be absolute or relative. Relief of this condition is usually accompanied by clinical improvement.

Hypertonic glucose solution injected intravenously has given the best results in relieving this condition.

Gum acacia solution has cured patients who did not respond satisfactorily to our usual methods of treatment. The probable explanation is that an injection of acacia solution increases the blood volume, lowers the viscosity, and thereby improves the circulation through tissues and organs.

PROTOCOLS

CASE 1.—M. T. (8464) was admitted on June 11, 1930, because of postpartum convulsions. Pregnancy had been uneventful. The patient was delivered of twins nine hours previous to admission. Two hours after delivery she began having convulsions. Out-patient intern sent patient into hospital. Examination: Patient was in coma. Temperature 37.8, pulse 140?, respirations 16. Blood pressure 150/90. Tongue was markedly swollen and protruding from mouth. No edema. Urine showed trace of albumin. Treatment was intramuscular $MgSO_4$, intravenous glucose, colonic irrigation, and 10 per cent Karo syrup solution through nasal tube. She had 6 convulsions after admission, and twenty-four hours after admission because of inability to maintain a blood dilution with intravenous glucose solution, a plasmapheresis was done. No particular effect was noted. Patient was in coma throughout this time. The temperature had increased to 39.5°, pulse varied from 130 to 172, and the respirations had increased to 36-48. Since the urine secretion was very poor, 30 per cent glucose solution intravenously was tried, but with no better effect. On June 13, 1930, forty-eight hours after admission she was given 500 c.c. of 6 per cent gum acacia solution. Because of loss of urine around the catheter, no accurate output figures are available, but glucose injection following the acacia resulted in a diuresis as evidenced by note stating that during glucose injection patient had voided 3 times around catheter in addition to drainage. Twelve hours after the acacia, the temperature was 37.8, pulse 128, respirations 28, and the patient would respond to commands. Karo syrup solution and water were given through the nasal tube. Clinically her condition continued to improve, and on June 15, 1930, she was conscious and rational, but still slightly drowsy. She was discharged on July 1, 1930.

CASE 2.—E. R. (9601) was admitted to the hospital on Oct. 15, 1930, because she had gained 29 pounds in weight in the past two months. She was at term Nov. 22, 1930, and had had edema of the feet for two weeks. Examination: Marked edema of legs and feet. Blood pressure 140/98. Urine contained a large amount of albumin. Twenty-four hours after admission her blood pressure had increased to 175/125. She was treated with colonic irrigation, $MgSO_4$ intramuscularly, and 1000 c.c. of 20 per cent glucose intravenously. A bag was inserted at 8 P.M., but at 12 midnight she began having convulsions. They continued in spite of glucose and $MgSO_4$ and the patient became comatose. A cesarean section was performed at 4:30 A.M. and twins were delivered. At 12 noon, the patient had another convulsion. In spite of glucose solution the urinary output was poor and the patient was stuporous. Five hundred c.c. of 6 per cent gum acacia were given at 5 P.M., and repeated the next day at 12 noon. Following the second acacia injection, the urine output improved and subsequent glucose injection resulted in an excellent diuresis. The next morning (Oct. 19, 1930) the pulse had dropped from 150 to 100 and the patient was clear mentally, although still sleepy. Thereafter, her course was uneventful and she was discharged on Nov. 7, 1930.

CASE 3.—M. W. (19540) was treated at the St. Louis City Hospital by Dr. Drabkin of our staff. She was a white woman, twenty-nine years old, gravida

iv, who delivered spontaneously at 5 A.M. on Feb. 9, 1931. At 7 P.M. she had a convulsion. Her blood pressure was 210/135 and the urine contained a large amount of albumin. In the next forty-five hours she had a total of 19 convulsions. Shortly after the first, she became unconscious and remained in coma for fifty-seven hours. During this period her blood pressure remained at an average level of 170/110. During a fifty-two-hour period, 750 c.c. of urine were recovered by retention catheter and in addition, the patient voided twice. During this period the patient had 3 colonic irrigations, 60 c.c. of a 50 per cent $MgSO_4$ solution by mouth several times, 25 per cent $MgSO_4$ intramuscularly, 6 injections of 750 c.c. each of 10 per cent glucose, and glucose and Dryco through a nasal tube. After she had been in coma for fifty-one hours and was considered moribund, 200 c.c. of 30 per cent gum acacia were added to 800 c.c. of 10 per cent glucose and given at 9 P.M. At 10 P.M. the nurse's note states "urine was leaking around catheter"; at 2 A.M., 120+ c.c. were drained through the catheter and at 4 A.M., the patient was conscious and able to respond to questions. The following morning she was given soft diet and her subsequent course in so far as her toxemia was concerned was uneventful.

It is noteworthy that although convulsions had been recurring at irregular intervals in spite of intramuscular $MgSO_4$, intravenous glucose, colonic irrigation, etc., and the patient was considered moribund, yet after the one injection of gum acacia solution, there were no more convulsions, coma cleared up rapidly and the urinary output was improved.

REFERENCES

Denecke, G.: Die Eklampsie, H. Hinselmann, Bonn, 1924, F. Cohen. *Stander, H. J., and Tyler, M.:* Surg. Gynec. Obst. **31:** 276, 1920. *Williams:* Obstetrics, ed. 6, 1930, D. Appleton and Co. *Stander, H. J.:* AM. J. OBST. & GYNEC. **12:** 633, 1926. *Stander, H. J.:* AM. J. OBST. & GYNEC. **13:** 551, 1927. *Schwarz, O. H., and Dieckmann, W. J.:* AM. J. OBST. & GYNEC. **18:** 515, 1928. *Czerny, A.:* Arch. f. exper. Path. u. Pharm. **34:** 268, 1894. *Erlanger, J., and Gasser, H. S.:* Ann. Surg. **69:** 389, 1919. *Rogers, L.:* Brit. M. J. **2:** 394, 1919. *Walker, M. A., and Keith, N. M.:* Am. J. Physiol. **95:** 561, 1930. *Hartmann, Alexis:* Personal Communication. *Irving, F. C., and Taylor, J. V.:* AM. J. OBST. & GYNEC. **17:** 767, 1929.

Lee: Maternal Pelvic Measurements Among the Chinese. National Med. J. China **16:** 704, 1930.

The four average pelvic measurements in a series of 1,132 Chinese women were: Intercristal, 26.14 cm.; interspinous, 23.13 cm.; external conjugate, 18.95 cm.; transverse outlet, 8.98 cm.

The pelvis in women from South China is smaller than that from either North or Central China but there is practically no difference between North and Central. The Chinese pelvis is considerably smaller than the Caucasian.

C. O. MALAND.

THE CULTURE, INCIDENCE AND TREATMENT OF TRICHOMONAS VAGINALIS*

By Edward L. Cornell, M.D., F.A.C.S., L. J. Goodman, M.D., and Mabel M. Matthies, M.D., Chicago, Ill.

(From the Prenatal Clinics of Northwestern University Medical School and Chicago Lying-In Hospital)

TRICHOMONAS vaginalis is becoming very common in the United States if one is to judge by reports oral and written which have come to our attention. Where the senior author has spoken about the disease and requested that the vaginal secretions be especially examined for this protozoon, physicians have been surprised at its frequency. One gynecologist was able to discover 75 cases in nine months in private practice where previously he had stated it was very rarely seen. For this reason this type of leucorrhea has been studied clinically by us.

Trichomonas vaginalis is a parasitic flagellate characterized by the presence of four anterior free flagella which tend to adhere in one strand basally. Attached laterally is an undulating membrane in the margin of which is a posteriorly directed flagella. Posteriorly an axostyle is present. In fresh specimens the organism is very actively motile, but as the specimen becomes cold the motion is gradually lost.

Donné, in 1836, was the first to describe the organism and he was of the opinion that it was associated with venereal disease. Kunster (1884) found it quite common in his clinic at Bordeaux, France. Dock (1891) was the first to report it in the United States. In 1916, Barlow reports 5 cases out of 100 examined in a clinic in St. Louis, Mo., but only in pathologic conditions such as chronic endometritis, endocervitis, and postpartum. Dock, Fonseca, and Marchand found the organism in the urine of men. In 1929 Davis and Colwell successfully cultured the organism.

Dextrose broth with human serum, as recommended by Davis, was first tried as a medium for growing the Trichomonas vaginalis in 10 successive cases, but without success. Then the Lynch medium, one part of human serum to ten parts of 0.5 per cent salt solution was used. In this medium the organisms grew freely. The formula was varied by using hydrocele fluid, clear and bloody, in place of the serum, and for a while a cyst fluid was used which contained a large quantity of native cholesterin. This latter was the most satisfactory medium of

*Read (by invitation) at a meeting of the Chicago Gynecological Society, November 21, 1930.

those that were tried. The Lynch medium, regular or modified, was used in 12 successive cases, and growth was obtained in 8. The 4 specimens which did not grow had been subjected to a short journey out of doors in cold weather after planting.

In several of the cases it was planned to keep the strain going as long as possible, and also to keep each culture alive as long as possible, but that was abandoned, because of the amount of work involved. However, a specimen planted on January 20 was carried through thirteen generations by April 10, transplants being made every third or fourth day. The longest time that the organisms of this strain were kept alive on these media was seventeen days, and in one instance they were capable of growth when transplanted on the sixteenth day. In one tube growth was not apparent until the eighteenth day. In several tubes the organisms became so few that none were found in the drops examined, and then after three to six days a large number were found. Another specimen was carried on for forty days, through ten generations, with survival of the organisms for ten days.

Fifteen other successive cases were planted on the media made with clear hydrocele fluid, and growth was obtained in fourteen.

Examinations of the tubes were made every third or fourth day, and at the height of the experiment as many as 160 tubes were examined in one day. In 50 per cent organisms were present, varying between a few to the drop to a hundred or more in a high-power field. At no time was any organism seen to be dividing, nor were any bodies seen that might be considered cysts.

These organisms present an interesting appearance by dark-field illumination. The light strikes the outline of the organism and leaves the body dark, while the flagellae are little streaks of flame. It is not easy, however, to count the flagellae in this way unless the motion of the protozoon is retarded.

The exact manner of transmission of the Trichomonas vaginalis from one individual to another is not understood. Each patient was questioned carefully as to the possible source of the infection and with the exception of one or two we have been unable to determine any common means of transmission. In these two patients we found that they had slept in the same bed with a woman who was said to have had a similar vaginal discharge although the authors did not examine either of these women to confirm the diagnosis.

It is seen in the virgin with an intact hymen and in the married woman. We are informed by H. W. Hottenstein of Akron, Ohio, that he discovered it in a child three years old. There had been a previous green discharge for three months with considerable soreness in the introitus. The diagnosis had been gonorrheal vaginitis although the stained smears were negative for the gonococci. He found active Tri-

chomonas when the patient presented herself to him. There is no question in the mind of the senior author but that many cases of vaginitis in children are due to the Trichomonas, although he has not been able to prove it scientifically because of the lack of material. The fact that Trichomonas vaginalis is diagnosed as gonorrhea in the adult so frequently leads us to this conclusion. The age of the patient seems to be no factor in the disease. We have seen it in women with senile atrophied vaginas where sexual intercourse has evidently been no factor.

Whether or not the male is able to harbor the Trichomonas sufficiently long to transmit infection is questionable, particularly in view of the fact that Trichomonas needs so much moisture for its growth. That the Trichomonas in the female can cause urethritis in the male is amply demonstrated by the fact that a case was brought to the attention of one of us (G) in which an acute urethritis was seen in the consort of a patient with Trichomonas vaginalis.

Two urologists report in an oral communication that they seldom see Trichomonas in the prostatic secretions or in urine specimens from males. With the prevalence of this disease in women, they should see frequent cases in men. We have seen the organism in the prostatic secretion of one man and in the urine of a second.

It is not infrequently found in the urine of women suffering with this type of leucorrhea. Many patients make no complaint while in a few a very severe cystitis develops. Ten per cent argyrol solution instillation into the bladder gives relief. We are unable to report further on the results of cures in cystitis.

A study was made to determine the percentage of pregnant women in Chicago suffering from Trichomonas vaginalis. This was done since there was a wide divergence of opinion in the literature as to its frequency. Frankel in a personal communication stated that 60 per cent of the women of Vienna harbored the organism. Crossen states that the Trichomonas vaginalis is found in about 40 per cent of all free vaginal discharges and is found in very large numbers in practically all severe and obstinate cases of vaginitis. In a series of 2000 cases Schroeder and Loeser found the flagellate in only about 6 per cent of the cases.

In the series of 581 consecutive cases it was found that 10.15 per cent of all the women harbored the organism. Of these 581 cases 500 were white women examined at the Chicago Lying-in Hospital, and in this group it was found that the incidence was only 7.6 per cent. Many of these women had taken douches before reporting for examination at the dispensary so that in all probability the percentage of infection is greatly reduced. Eighty-one of the original 581 cases were colored. They were examined at the Northwestern University pre-

natal clinic, and the percentage of infection in these patients was 26. Here, too, many of the women had taken douches before examination. In private practice (G) out of 98 cases 3 per cent harbored the organism. From these figures one is led to believe that the infection is more prevalent in the lower strata of society due perhaps to unhygienic conditions.

The method used in examining specimens was to take a small platinum loopful of vaginal secretion from the finger of the examiner and dilute immediately with warm normal saline on a hanging drop slide. The organisms are plainly seen either under low or high power of the microscope.

A woman may harbor the Trichomonas without producing any symptoms except an occasional increase in the vaginal discharge. The acute process is rather typical and constant. The patient will first complain of an itching of the vulva and vagina, the degree varying considerably from mild to a very severe itch. Occasionally the first complaint consists in a soreness of the vagina. The next symptom usually is a marked increase in the vaginal secretions. There may be an odor which is pungent. The amount of discharge varies from scanty to profuse. Occasionally it is so profuse that it runs down the leg. If the patient does not seek medical attention she next notices that sexual intercourse is exceedingly painful or if she is a virgin that the cleansing of the vagina is painful. The vagina feels hot at this time and the itching is usually severe. If allowed to continue the soft parts become excoriated and somewhat edematous.

Vaginal examination by the physician is usually very painful, even the insertion of a vaginal speculum is accompanied by considerable pain.

In the typical case as soon as the vaginal speculum is opened there is a very characteristic appearance of the vagina and cervix. The entire vaginal wall is covered with a light yellowish green discharge which is fluid in character. It contains many pin point sized bubbles and here and there above the film of secretion appear little red points looking very much like granulations. These give the vagina the appearance similar to the red spots on a strawberry. For this reason the term strawberry vagina has been applied. This film of secretion extends over the cervix and the strawberry spots can be readily seen in this location. When the secretion is mopped out, the vagina appears markedly reddened and the strawberry spots stand out clearly. The whole vagina is extremely tender even to the touch of cotton pledgets.

Kleegman speaks of certain types of cervical erosions as being characteristic in this type of leucorrhea. In a rather large experience, we have failed to note these erosions. There is no other type of vaginitis which clinically presents the same picture.

In mild cases, presenting few if any symptoms, the itching may be entirely absent. The secretion may not be yellow in color and the bubbles may be few in number or entirely absent. The frothy appearance was noted in only 5 per cent of the cases in the series. This does not mean that no bubbles were present, but that their presence was not marked.

It is of especial interest to note that of the 38 positive cases found in the Chicago Lying-in Hospital group only 12 complained of symptoms.

Gragert in a series of 55 pregnant women, infected with Trichomonas, found that the total puerperal morbidity in those cases not treated antepartum was 29.1 per cent, while in the treated cases, only 16.4 per cent.

Of the 38 positive cases found at the Chicago Lying-in Hospital, 26 came back for delivery. These were followed postpartum in order to determine the puerperal morbidity. It was found that the Trichomonas did not influence the lying-in period in any way. Three of the patients did have a temperature above 100° F., but it was due to coryza, mastitis, and pyelitis respectively. All cases were treated before delivery, but none were free of the organism at the time of delivery. We conclude from these facts that Trichomonas vaginalis does not influence puerperal morbidity.

While the treatment of this disorder presents little difficulty so far as relieving the clinical symptoms, it does present many difficulties in securing a positive cure. We feel that the cures reported in the literature with such frequency have been cures of the clinical symptoms only. The Trichomonas have not been entirely removed from the vagina. If one is able to follow these patients over periods of many months, it is found that recurrences are very common, especially after the catamenia. Unless one warns these patients to come in at frequent intervals for hanging drop smears, many are regarded as cured by the physician when as a matter of fact the Trichomonas are still present in the vagina but are not at that moment causing clinical symptoms.

The senior author has used all of the treatments recommended from time to time. Among the various things that he has used may be mentioned mercurochrome, methylene blue, gentian violet, acriflavine, glycerin with or without bicarbonate, tincture of iodine, hexylresorcinol, lead acetate, zinc oxide ointment, metaphen, etc. Each of these various drugs will produce clinical cures but they have not consistently rendered the vagina clear of the Trichomonas. The only treatment that seems to cure consistently and permanently has been the treatment recommended by Sophia Kleegman. This consists essentially in applying Lassar's paste on wool tampons in the vagina which has been washed out with soap and water and mercurochrome.

Recently we have used an ointment put out by Abbott & Company, using metaphen as the germicide. Up to the present time we have not seen any marked improvement in the treatment with this ointment in spite of the fact that metaphen itself seems to be a splendid germicide in other types of vaginal discharge.

The essentials in the treatment of this discharge are to have the medication come in contact with the entire vaginal mucous membrane, to have it of the type which produces a drying effect rather than a great deal of moisture, to clear up all cervical erosions, Nabothian cysts, etc., and to carry the treatment on throughout several menstrual periods. The organisms grow more rapidly at the end of the menstrual period than at any other time during the menstrual cycle. Whether or not this is due to the fact that the blood is a good medium for its growth we are not prepared to say. The Kleegman treatment can be readily carried out during the menstrual period, and it should be done for at least four or five periods after the secretions have been repeatedly reported negative for the Trichomonas.

The literature reports that these cases can be readily cured in the early months of pregnancy. This has not been our experience. Consistent and persistent treatment during the early months of pregnancy have failed to cure the discharge. We have been able to alleviate it and make the patients comfortable, but examinations of the secretions in the latter months of pregnancy have invariably shown the presence of Trichomonas. A few of these patients have been clinically free of symptoms and others have had considerable torment from the vaginal itching.

There have been patients who are clinically free of leucorrhea when not pregnant. During pregnancy the symptoms are marked. This was noted in one private patient whose history is briefly noted.

Mrs. B., No. 1769, at thirty-four years of age in her first pregnancy developed Trichomonas vaginalis in October. She delivered Nov. 3, 1924, the highest temperature of the puerperium being 100°. On Dec. 17, 1924, the smear was positive for Trichomonas. Because she was nursing a baby she was given soda bicarbonate douches which apparently cleared the discharge. On April 27, 1926, she returned nonpregnant with active Trichomonas. Under acriflavin tampons and soda douches she became free in June, 1926. She became pregnant in October, 1926. During this pregnancy she remained free from Trichomonas vaginalis. Dec. 3, 1927, five months after delivery, she returned nonpregnant with Trichomonas present. She remained under treatment for a month and a half with baking soda and glycerin and was pronounced free at the end of this time. She became pregnant March 28, 1929; the secretions were normal until September when we found the Trichomonas in great number. She was treated with soda bicarbonate douches and tampons and delivered Jan. 5, 1930. At her final examination, April 18, 1930, she was still positive for the Trichomonas. She decided to use baking soda douches at home and we are not certain that she is cured since she has not returned.

Thirty-two private patients (C) have been selected for the study of the various treatments recommended. These patients have been

followed sufficiently long for us to establish the status of the cure.

Lacto-Dextrin in glycerin was used in four patients as a tampon. In two patients a cure was obtained.

Acriflavin was used in a watery solution on tampons in two cases with one cure. This patient was sixty years old and had a senile vagina.

Hexylresorcinol, in full strength, was used on wool tampons in four cases with two cures.

Lead acetate was used in five cases with one cure. This was applied in form of a one-ounce injection daily. The cure was obtained in a patient who had had several forms of treatment with no result. She finally persisted in the use of the injections for a period of about six months.

Tincture of iodine was used once with a cure but the treatment was so severe that it was given up.

Soda bicarbonate in glycerin on tampons was used in nine cases with three cures.

The Kleegman treatment was used in ten cases with seven cures. The only variation made in the treatment was to leave out the pyroligneous acid.

Two patients, who are still under treatment, have been under management for two years or more. These patients will remain cured for periods of two or three months and then have a return of symptoms usually following a period.

Miss L., No. 2430, a virgin of twenty-six reported April 21, 1928, complaining of a profuse vaginal discharge of five months' duration; the itching was severe. She also had dysuria; Trichomonas were found in great number. She was given soda bicarbonate and glycerin tampons and douches. The vagina was negative for Trichomonas May 14, 1928. On May 21, 1928, a smear was taken and many Trichomonas were found. She was then given quinine bisulphate tampons and quinine douches until June 25, 1928, when the smear was again positive. She was changed to the soda douche which she continued at home until Feb. 11, 1929, when she was started on a series of hexylresorcinol tampons until March 25, 1929, when no Trichomonas were found. She remained free until April 16, 1929 when she was again placed under treatment, using glycerin and colloidal iodine spray. From that time until June 3, 1929, she remained free of symptoms but positive for Trichomonas. She returned Sept. 10, 1929 with marked pruritus vulvae. At this time she was again strongly positive for the Trichomonas. She was unable to have local treatments and was given liquor zinci et alum compound as a daily injection. On Dec. 9, 1929, she began a course of Lassar's paste tampons; these were kept up throughout January. From Feb. 3, 1930, until Feb. 20, 1930, she was negative. This was just before the oncoming period, at which time we found the smears positive. She was again placed on Lassar's paste tampons during the menstrual period and again in March, 1930. She remained free of Trichomonas from Mar. 24, 1930, until June 16, 1930, at which time she had a recurrence. She was given the Lassar's paste treatment again throughout the remainder of June and July. She remained free until her August period, Aug. 28, 1930, when she was positive for Trichomonas. She was given treatment during the September

and October periods when she was pronounced free. On Nov. 6, 1930, she was again under treatment during her menstrual period. On Nov. 14, 1930, she was pronounced free. Whether this patient remains free indefinitely now remains to be seen. This case demonstrates conclusively that in spite of active treatments over a period of two years that the disease is difficult to cure and control.

One patient cured by the Kleegman treatment had been under the care of one of us for a period of a year without result. The Kleegman treatment cured this patient promptly in three months' time.

CONCLUSIONS

1. Dextrose broth with human serum was unsucessfully used as a medium for growing Trichomonas vaginalis.
2. The Lynch media, plain or modified by hydrocele or cyst fluid, was very good.
3. The organism will grow on artificial media equally well in winter as in the summer.
4. The disease is seen in patients of all ages.
5. In our series of 581 pregnant women 10.15 per cent of the women harbored the organism.
6. The infection is perhaps dependent upon the hygienic life of the individual.
7. The Trichomonas vaginalis does not produce symptoms in all cases. Only 12 patients out of 38 positive cases in our series complained of symptoms.
8. The diagnosis of Trichomonas vaginalis cannot be made from the character of the discharge alone.
9. Puerperal morbidity is not increased by the presence of the Trichomonas vaginalis.
10. The cervical erosion mentioned by Kleegman have not been noted.
11. The modified Kleegman treatment has given the best results.
12. A cure should not be pronounced until at least four menstrual periods have elapsed without treatment of any description.

REFERENCES

(1) *Andrews, J. M.:* J. Parasitol. **12:** 148, 1926. (2) *Crossen, H. S.:* Diseases of Women, 1923, p. 282. (3) *Davis, C. H., and Colwell, C. J.:* J. A. M. A. **92:** 306, 1929. (4) *Davis, C. H.:* Am. J. Obst. & Gynec. **18:** 575, 1929. (5) *DeLee, J. B.:* Illinois M. J. **37:** 186, 1920. (6) *Dock, G.:* Am. J. M. Sc. **111:** 1, 1896. (7) *Donné, A.:* Rech. Microscop, la Natur du Mucus, Paris, 1837. (8) *Escomel, E.:* Bull. Soc. Path. Exot., Par. **10:** No. 7, 1917. (9) *Fantham, H. B., Stephens, J. W., and Theobold, F. V.:* The Animal Parasites of Man, London, 1916, J. Bale. (10) *Gragert, O.:* Monatschr. f. Geburtsh. u. Gynäk. **5:** 37, 1923. (11) *Greenhill, J. P.:* Am. J. Obst. & Gynec. **16:** 870, 1928. (12) *Hegner, R. P.:* J. Parasitol. **9:** 15, 1922. (13) *Ibid.:* Arch. f. Gynäk. **120:** 1, 1923. (14) *Idem:* Am. J. Hygiene **5:** 302, 1925. (15) *Idem:* J. A. M. A. **90:** 741, 1928. (16) *Idem:* Science **70:** 530, 1929. (17) *Jollos, V.:* Darinflagellaten des Menschen, Handbuch der Pathogen. Mikroorganismen, ed. 2, Jena, G. Fisher, 1913, 7, 687. (18) *Kessel, J. F.:* J. A. M. A. **90:** 1089, 1928. (19) *Kleegman, S. J.:* Surg. Gynec. Obst. p. 552, Oct., 1930. (20) *Lewis and Carroll:* Am. J. Urol. **19:** 337, 1928. (21) *Lynch,*

K. M.: Am. J. Trop. Dis. **2:** 627, 1915. (22) *Idem:* J. A. M. A. **79:** 1130, 1922. (23) *Idem:* Am. J. Trop. Med. **2:** 531, 1922. (24) *Idem:* Am. J. Trop. Med. **4:** 537, 1924. (25) *Marchand, F.:* Zentralbl. f. Bakteriol. u. Parasitol. **15:** 709, 1894; **16:** 74. (26) *Meyer, O.:* Inaugural Dissertation, Berlin, 1927. (27) *Ohira, T., and Noguchi, H.:* J. Exper. Med. **25:** 341, 1917. (28) *Pitterlein, W.:* Thesis de doct., Berlin, 1926. (29) *Ponoschina:* Russian J. Trop. Med. No. 91, 1923. (30) *Riba, L. W., and Perry, E.:* Am. J. Urol. **22:** 563, 1929. (31) *Schroeder and Loeser:* Monatschr. f. Geburtsh. u. Gynäk. **5:** 49, 1919. (32) *Webster, R. W.:* Diagnostic Methods, Philadelphia, 1923, P. Blakiston's Son and Company.

(For discussion, see page 445.)

TRICHOMONAS VAGINALIS (DONNÉ), A PRELIMINARY STUDY*

By Irving F. Stein, M.D., and Elizabeth J. Cope, S.B., Chicago, Ill.

(From the Albert Kuppenheimer Fund of the Michael Reese Hospital and Nelson Morris Institute for Medical Research)

THE occurrence of flagellates in the vagina of women was recorded first by Donné[1] in 1837 and has been reported repeatedly since that time. Dock[2] was the first writer to report a case in this country. These flagellates have been grouped as one species and designated as Trichomonas vaginalis. The question of their pathogenicity is an open one. We believe, however, that they are the exciting factors in a form of vaginitis presenting a definite clinical entity. This type of vaginitis is characterized by a foul smelling, profuse purulent discharge in which large numbers of living protozoa and but few bacteria are found. Although usually found in the presence of a purulent leucorrhea, they have also been found in the vagina in the absence of clinical symptoms. When Trichomona vaginalis are present in the vagina in appreciable numbers, the clinical picture is typical. In fact, diagnosis can be predicted with a fair degree of accuracy from the patient's complaints. Itching, burning and chafing are the chief complaints associated with a profuse, offensive, and persistent discharge. The symptoms are aggravated just after the menstrual period, when vaginal pain, dyspareunia, and difficulty in walking may be experienced due to marked scalding of the opposed surfaces of the thighs. The discharge is usually greenish-yellow, or sometimes pinkish from the presence of red blood corpuscles. The odor is decidedly offensive. A characteristic of the discharge is the presence of numerous bubbles. The inner surfaces of the thighs are seen to be reddened and sticky, the labia bathed in purulent discharge, and upon separating the labia, a quantity of the purulent discharge usually escapes. The vaginal mucosa is reddened, and the papillae are distinctly enlarged, red and sometimes oozing. This change in the mucosa is most marked in the

*Read at a meeting of the Chicago Gynecological Society, November 21, 1930.

upper portion of the vagina. The cervical canal is not usually involved, and unless there is additional chronic endocervicitis, the cervical mucus is clear. The portio vaginalis, on the other hand, is mottled with superficial reddened areas. Upon examination of the discharge, many pus cells, red blood corpuscles, few bacteria and numerous actively motile Trichomonas may be seen in hanging drop. The material should not be taken with a swab, but with a wire loop. The addition of a drop of physiologic salt solution aids the examination both by diluting the thick purulent material and also stimulating greater activity of the flagellates. Stained slides are not satisfactory for verification of the diagnosis.

We have found Trichomonas in purulent leucorrhea in 76 women of various ages. Four were unmarried girls of seventeen to twenty-five years of age, in whom no evidence of gonorrhea could be found, one of whom however had been treated for gonorrhea, and all were found to have typical Trichomonas vaginalis vaginitis. We have treated a few patients past the menopause for irritating leucorrheal discharge in whom Trichomonas were found; one of these was a widow fifty-three years old who had not menstruated for seven years, and who complained of the persistent and offensive discharge for about a year. She was referred by an internist who believed that she had carcinoma of the cervix because of the blood-stained offensive discharge. Treatment is more satisfactory in this group probably because of the absent menses. The largest group were in married women of the reproductive age. In many of these there was an old history of gonorrhea and the return of a purulent discharge was thought to be a recurrence. However, we have not observed gonococcus and Trichomonas present at the same time in any case. A number of women first presented the picture of Trichomonas vaginitis after cautery treatment for chronic endocervicitis. One woman presented a chronic inflammation of Skene's tubules at the same time as a Trichomonas vaginitis. She was also under observation because of sterility. Upon clearing up of the above conditions she became pregnant. We have hunted for flagellates in children who have been treated for vaginitis but none were found.

Trichomonas vaginalis when examined in hanging drop is very motile, moving in circles with a characteristic vibrating motion. It is about 15 to 25 microns in length and 10 to 15 microns in width. There is a very great variation in size, however. The flagellates seen in cultures are frequently very small. They also vary greatly in shape. They may be pyriform, amoeboid, spheroidal or fusiform. Typically they are pear-shaped, rounded at the anterior and pointed at the posterior end. Anteriorly, there are four flagella which arise from blepharoplastic granules. An undulating membrane arises on the anterior

end and extends about two-thirds of the length of the cell wall. This is probably responsible for locomotion of the Trichomonas. Close to the anterior end of the cell body there is a large spindle-shaped nucleus, containing scattered chromatin granules and sometimes a karyosome. The body of the flagellate is finely granular, colorless and frequently contains numerous food vacuoles which may be filled with bacteria. Very little is known of the life history of Trichomonas vaginalis; cysts have never been identified. Reproduction is by binary longitudinal fission.[3, 4]

Trichomonas hominis, a flagellate frequently found in the stools is morphologically similar to Trichomonas vaginalis. The chief variation is in the length of the undulating membrane. There is some question as to whether the two varieties are the same or are closely related. Both are seen to change in size and shape under varying conditions and, in some cultures, the undulating membrane of the Trichomonas vaginalis extends the entire length of the organism.

Many attempts have been made to cultivate the vaginal flagellate artificially with more or less success. Lynch[5] was the first to report success using beef broth medium. Lynch[6] and Greenhill[7] both report success growing Trichomonas in blood serum diluted with sodium chloride, with Locke's or with Ringer's solutions. They also tried half ascites fluid and Ringer's solution according to the method of Ohira and Noguchi[8] and sodium chloride-serum-water, Hogue's formula. Ten parts of nephritic urine to one part of blood serum was also used as a culture medium. Davis and Colwell[9, 10] tried ordinary glucose broth, glucose brain broth and nutrient brain broth with and without the addition of blood cells with no success. Some of the flagellates survived for forty-eight hours or longer but there was no apparent increase in numbers, and no subcultures could be grown. They made repeated attempts with strains from different patients using a serum-saline-citrate medium (Hegner), Locke's solution enriched with ascites fluid, and Locke's egg medium. These likewise were unsuccessful. They secured their first successful cultures using Locke's solution plus 5 per cent human blood; later the serum only was used. Glucose broth plus 5 per cent human serum was found to be more satisfactory; one strain in this medium was carried through 23 subcultures and others through varying numbers. They noticed that the organisms retain their motility best when large tubes containing approximately 15 to 20 c.c. of medium were used. Davis' procedure was as follows:

Transfers were made every third day, taking some of the material from the bottom of the tube with a pipette because the flagellates seemed to grow there more luxuriantly. A P_H between 5.1 and 8.5 was found to be necessary for growth.

Hogue[11] working with Trichomonas hominis reports satisfactory re-

sults with the use of serum-salt-water method, 10 to 15 c.c. of a mixture of sterile sheep serum and water was added to 100 c.c. of physiologic salt-tubed in 15 to 20 c.c. amounts and put in an Arnold at 100° C. for one hour on three successive days. Transfers were made to the bottom of the tube and evaporation was prevented by sealing with a small amount of paraffin oil on top of the medium. The serum coagulated and on this coagulant the Trichomonas grew. Hogue found a P_H of 8 the best for rapid growth but between 7.2 and 7.4 the best for prolonged growth. Andrews[12] reported successful results growing Trichomonas vaginalis on agar slants which were covered with serum-saline-citrate solution. Asparagin medium was tried also but on this, growth was slow and scanty.

CLINICAL INVESTIGATION, CULTURAL STUDIES

Trichomonas have been reported consistently in four locations in the human body, namely, the rectum, the vagina, the mouth, and the lungs. In this study we are particularly interested in Trichomonas vaginalis and its pathogenicity.

In order to study the life cycle of the Trichomonas vaginalis, its habits, its individuality, relationship to other flagellates, and the method of transmission, it was necessary to find a satisfactory method of obtaining an early luxuriant culture of the organism. The material to be cultured was removed directly from the vagina by means of a sterile pipette and bulb through a bivalve speculum. This was placed in 3 to 4 c.c. of placenta broth (described later in the text) and kept as near incubator temperature as possible until it was brought to the laboratory. Microscopic examinations were made in hanging drop by daylight and with the dark-field. Inoculations were made with a sterile pipette using ½ to 1 c.c. for each tube. A number of different media were tried before one was found which gave satisfactory results; three or four different media being tried simultaneously. Five patients with typical leucorrhea containing Trichomonas vaginalis brought warm stool specimens to the laboratory. Repeated and diligent search failed to reveal any flagellates present in the stool specimens. Nevertheless the first media used were those on which Trichomonas hominis grow rapidly.

Hogue's medium No. 1[13] has been used very successfully in growing Trichomonas hominis. It is prepared by shaking one hen's egg in a flask with glass beads and adding 200 c.c. of Locke's solution. This mixture is heated in a water-bath for fifteen minutes during which time it is agitated constantly. It is then filtered through cotton with the aid of a suction pump, tubed in 10 to 15 c.c. amounts and autoclaved at 15 pounds for ten minutes. This medium was inoculated with Trichomonas vaginalis from 22 patients. The cultures were ex-

amined at the end of twenty-four and of forty-eight hours' incubation at 37° C. In only two cases were flagellates present at the end of either period. In one case, they lived for three days with an apparent slight increase in the number present—showing that they were not simply surviving. Subculturing on this medium was not successful. In the second case, however, Trichomonas vaginalis were alive at the end of twenty-four hours only and survived in one subculture for twenty-four hours. Since there was no increase in numbers and since further subculturing gave negative results, it is likely that in both the original culture and the one positive subculture there was merely a survival of some of the flagellates implanted. This medium was listed therefore as unsatisfactory for the growth of Trichomonas vaginalis.

The second medium tried was physiologic salt solution plus 5 per cent human blood serum. This was inoculated with eleven strains. In two only were there any flagellates present on examination after twenty-four and forty-eight hours. In one instance they survived, but apparently did not increase in numbers, for three days; in the other, for two days. This combination was likewise added to the list of unsuitable media. Dextrose veal infusion broth P_H 7.6 with 5 per cent human blood serum was tried next. Strains from 13 patients were introduced into this medium, with negative results in seven cases. In one case, Trichomonas vaginalis were found at the end of one day only; in another, at the end of two days and no satisfactory subcultures could be made. In three cases the flagellates were present for two days with apparently a slight increase in number, and one subculture from each, survived for one day only. In one case, motile flagellates were found after three days and two subcultures lived one and two days respectively. Only in the original cultures however was there any evidence of multiplication. This medium was therefore discarded.

The medium used by Davis[9] was tried also. Six strains were inoculated into tubes containing 15 to 20 c.c. of Locke's solution with 5 per cent human blood serum. One showed no growth; one survived for one day only and four for two days. There was apparently a very slight increase in number in the four and subcultures were not made because a medium was desired on which the Trichomonas vaginalis would grow luxuriantly and for a long period of time.

A mixture of half ascites veal infusion broth P_H 7.6 and Locke's solution with 5 per cent human blood serum was inoculated with eleven strains. Two cultures were negative. In four the flagellates survived for one day and no positive subcultures could be obtained; in three, they lived for two days with survival in two subcultures for twenty-four to forty-eight hours. In two instances, the flagellates

lived for three days and could be subcultured once, surviving one day in the second culture. This medium was felt to be unsatisfactory and its use was discontinued. In an attempt to approximate conditions in the vagina, a nutrient broth, using an infusion of human placenta instead of veal as a base, was prepared (P_H 7.6) and tubed in 15 to 20 c.c. amounts, 5 per cent human blood serum was added to this immediately before it was used. Trichomonas vaginalis from 14 cases were put in this medium with negative results in four instances. There was a noticeable increase in the number of flagellates present in the other cultures for from one to four days, the average being two days. Subculturing was no more satisfactory than it had been with any other medium. One case was an exception, however, and lived through six subcultures, each of which survived two to three days.

Since liquid media did not give good results, it was thought that a solid medium covered with a nutrient liquid, similar to that used by Andrews,[12] might give more satisfactory results. Boeck and Drbohlav[14] made a medium which answered these requirements and which they found to be very satisfactory for growing Endamoeba histolyticus, Trichomonas hominis, Chilomastix mesnili, and other parasites. It was prepared as follows:

> "Four eggs were washed, brushed with alcohol and broken in a sterile flask containing glass beads. Fifty c.c. of Locke's solution were added and the mixture broken up by shaking. Test tubes were then filled with sufficient medium to produce a slant about 3 inches in length when coagulated with heat. The tubes were slanted in an inspissator and heated to 70° C. until the egg mixture is solidified, and then autoclaved at 15 pounds for twenty minutes. These slants are covered with either a mixture of Locke's solution and human serum or a 1 per cent solution of crystallized egg albumin."

The solutions were used alternately and gave the same results. Fifteen strains were inoculated into this medium; of these two showed no Trichomona after twenty-four hours and five showed them for one day only and gave negative results on subculture. Three were positive for two days with negative results on subculture. Three were positive for two days, with one and two positive subcultures. Two had motile Trichomona for three days but two and three subcultures were all that could be obtained from them. Therefore this was discarded.

At the same time we tried an agar using beef testicles as a source of nutriment. Slants of this medium (5 per cent agar P_H 7.6) were covered with Locke's solution and 5 per cent human blood serum. Seventeen strains were put in this medium, nine giving negative cultures. One survived for one day and four for two days with no positive subcultures. Three lived three days and two positive subcultures were obtained with very slight increase in the number of flagellates.

TWO NEW MEDIA FOR SATISFACTORY CULTIVATION OF TRICHOMONAS VAGINALIS

Since blood was thought to be an important constituent in the medium for growing flagellates, blood agar slants were covered with Locke's solution and 5 per cent human blood serum. This proved a very satisfactory medium. Eight strains have been placed in this medium to date, and growth was secured in all. Cultures live and the flagellates multiply. The life of cultures seems to vary, however, a few living but two or three days, most of them from five to seven days and some from fifteen to twenty days. One strain lived through but 4 subcultures; another through 20; another through 17 and the remaining 5 are still alive, one in the seventh subculture, one in the eighth, one in the twenty-sixth, one in the thirty-third and one in the forty-fifth. From three to thirteen weeks have elapsed since these strains were isolated from the patients.

Another very satisfactory medium was found. Agar slants P_H 7.6 were made by the same method as veal infusion agar slants excepting that fresh human placenta was used in place of the veal. No effort was made to remove the blood, which turned chocolate, because it was believed that there might be some sex hormone present which would increase the nutritive value of the medium. Locke's solution with 5 per cent human blood serum was used to cover the slants. This medium was inoculated with strains from 9 patients, and growth was obtained in all. Two strains were allowed to die after the second subculture due to an emergency pressure of other work. One of the remaining 7 was carried through 19 subcultures and another through 17. The remaining 5 are still alive, one is in the seventh subculture, one in the eighth, one in the twenty-fifth, one in the thirty-third, and one in the forty-sixth. Between two and thirteen weeks have elapsed since these strains were first put on artificial medium. Some of the subcultures have shown multiplication for only one day. The majority however have been very actively alive for four to seven days and some have remained alive and multiplying for sixteen to twenty-nine days. In both of the last two media mentioned, it has been observed that to a certain extent, the flagellates grow more luxuriantly on artificial medium after several subcultures.

ANAEROBIC CULTURES

Andrews[15] working with other species of flagellates showed that saturating the medium with oxygen or with carbon dioxide had no effect on the growth of flagellates. He also showed that they could be grown under reduced oxygen conditions. Every worker with Trichomonas vaginalis has observed that they grow best at the bottom of the test tube. In order to see whether Trichomonas vaginalis would

grow under true anaerobic conditions or simply with reduced oxygen, anaerobic cultures were made. Testicular agar with Locke's solution and 5 per cent human blood serum as described above was inoculated with Trichomonas vaginalis from two patients and incubated in a McIntosh and Fildes anaerobic jar.[16] These cultures remained alive and increased in numbers for four and six days, and lived in subcultures for from one to seven days. Similar anaerobic cultures were made in the anaerobic jar using the blood agar medium described above. Ten strains were cultured, of which two did not grow. The remaining eight grew for from one to nine days, the average time being four days. Anaerobic cultures were made using the same method with the placenta agar medium described above. Seventeen strains were cultured, one showing no growth, and the remainder grew from one to fifteen days, the average being five days.

In all of our cultures, anaerobic and aerobic, only those in which the flagellates were actively motile and in which there was a notable increase in numbers of Trichomona were recorded as positive.

CONCLUSIONS

1. Trichomonas vaginalis is regularly found in the vaginal discharge of women complaining of offensive leucorrhea presenting a characteristic clinical picture.

2. Seventy-six cases were studied, chiefly in married women during the reproductive period. A few were observed in single girls and in women past the menopause.

3. Trichomonas vaginalis do not grow artificially on the same medium as do Trichomonas hominis.

4. Stools from five patients with vaginal trichomonas failed to reveal either Trichomonas vaginalis or Trichomonas hominis.

5. Cultures were made from 26 patients in whom Trichomonas vaginalis were identified by microscopic examination. All were positive by cultural methods.

6. Trichomonas vaginalis grow and multiply under anaerobic as well as aerobic conditions.

7. Two new media which proved most satisfactory for cultivating Trichomonas vaginalis have been described. Growth and multiplication of the Trichomonas vaginalis on these media has been carried on successfully through 40 subcultures extending over a period of three months. Five of these strains are still alive at the time of this writing.*

REFERENCES

(1) *Donné, A.:* La Natur du Mucus, Rech. Microscop. Paris, 1837. (2) *Dock, George:* Am. J. Med. Sc. **111:** 1, 1896. (3) *Craig, C. F.:* Parasitic Protozoa of Man, 1926, p. 215. (4) *Hegner, R.:* Am. J. Hygiene **5:** 302, 1925. (5) *Lynch,*

*The counsel and assistance of Dr. Wm. Thalheimer and Dr. K. Howell of the Nelson Morris Institute are hereby gratefully acknowledged.

K. M.: Am. J. Trop. Med. **2:** 531, 1922. (6) *Lynch, K. M.:* J. A. M. A. **79:** 1130, 1922. (7) *Greenhill, J. P.:* Am. J. Obst. & Gynec. **16:** 870, 1928. (8) *Ohiro, T., and Noguchi, H.:* J. Exper. Med. **25:** 341, 1917. (9) *Davis, C. H.:* Am. J. Obst. & Gynec. **18:** 196, 1929. (10) *Davis, C. H., and Colwell, C.:* J. A. M. A. **92:** 306, 1929. (11) *Hogue, M. J.:* Johns Hopkins Hosp. Bull. **33:** 437, 1922. (12) *Andrews, N. M.:* J. Trop. Med. **32:** 929, 1929. (13) *Hogue, quoted by Craig, C. F.:* Parasitic Protozoa of Man, 1926, p. 537. (14) *Boeck and Drbohlav:* Quoted by Craig—p. 536. (15) *Andrews, N. M.:* J. Para. **12:** 148, 1926. (16) *McIntosh, and Fildes, P.:* Brit. J. Exper. Path. **2:** 153, 1921.

310 South Michigan Avenue.

(For discussion, see page 445.)

WHAT ARE THE FUNCTIONS OF A UNIVERSITY WOMAN'S CLINIC?*

By H. J. Stander, M.D., Baltimore, Md.

A UNIVERSITY woman's clinic, or the well-known "Frauenklinik" of the Germans, is a hospital limited to the care of pregnant and parturient women, as well as women suffering from conditions, affections or diseases associated with, or part of, their reproductive system. The purpose of such a clinic is to afford the best possible care for all patients entering its doors, to properly educate medical students in the art and science of obstetrics and gynecology, and lastly to encourage and sponsor investigations in the all too numerous problems awaiting solution in this field of medicine.

It is not the purpose of this paper to trace the origin and development of the "Frauenklinik" or Woman's Clinic, but it is well that we recall Johann Jacob Fried, who undoubtedly founded the first true woman's clinic in the beginning of the eighteenth century, in Strasbourg, Germany. It must also be pointed out, however reluctantly, that while the woman's clinic was developed from Fried's original concept as a comprehensive whole in Germany, this was not the case in France, England, or the United States of America. In these latter countries midwifery, or obstetrics usually followed one path, and its sister or daughter branch, gynecology, traveled a different way and often became affiliated with surgery; and so men have been trained as obstetricians or as gynecologists, the two groups having nothing or very little in common. It is only recently that most of us in this branch of medicine have begun to realize that we are far behind the Germans, and that our teaching of medical students, and consequently the medical care of our patients, must be greatly lacking.

It will take us too far afield to discuss the conditions and circumstances which lead to this unfortunate separation of the two branches which constitute that part of medicine pertaining to the reproductive system of the woman. Suffice it to say that no one practicing obstet-

*Read at a meeting of The Alumni Association of the Lying-In Hospital, New York City, December 10, 1930.

ries, without a first-hand appreciation of pelvic surgery or gynecology, can do full justice to his patient; and this applies equally well to the gynecologist who is untrained in obstetrics. A few clinics in this country have fortunately adhered to the German concept of a woman's clinic, and to these we owe a great deal for preserving the ideals of Fried and his pupil, Roderer. During the past few years we have happily seen several of our leading universities taking the necessary steps toward establishing woman's clinics, and thus cementing the two branches of this medical specialty into a complete unit, which must inevitably result in more adequate care of patients, better teaching of students, and a keener appreciation and further development of research.

Why this special interest in, and this endeavor to improve the teaching of obstetrics and gynecology? The main reason lies in the fact that our maternal and fetal mortality in this country is appalling, and that inadequate obstetric training is the forerunner not only of a heightened maternal and fetal mortality, but also of a large part of gynecologic operations.

In a very thorough statistical study of maternal mortality in the United States, covering a twenty-two year period, ending in 1921, Woodbury showed that the maternal death rate increased from 13.3 in 1900 to 16.9 per 100,000 population in 1921. From puerperal infection it increased from 5.7 in 1900 to 6.8 in 1921; and from all other causes it increased from 7.6 in 1900 to 10.1 in 1921. Woodbury, in comparing maternal mortality in the United States with that in 20 foreign countries which have official registration statistics, finds the death rate in this country the highest, being 7.99 per 1000 live births; while Denmark and the Netherlands have rates of only 2.35 and 2.42, respectively. He states that although the comparability of these figures must be carefully studied before one can draw any final conclusion, it is evident that the United States ranked among the countries with the highest rates, such as New Zealand and Chile; while the British Isles and Germany occupied an intermediate position, and the Scandinavian countries and the Netherlands showed low death rates. Since statistics compiled by this author show that the total number of confinements is only about 3 per cent larger than the number of live births, the mortality rate calculated on live births gives us a fairly close approximation of the true risk of dying in childbirth; furthermore, to avoid errors arising from differences in definition of stillbirth, it is preferable to use the rate based on live births when comparing different countries. We may then express the maternal mortality rate in this country in another way, namely, that one in every 125 women die incident to childbearing; a truly staggering sacrifice. Nothing has been accomplished in the past quarter of a century to reduce this frightful death rate incident to childbirth.

Comyns Berkeley, in a brilliant lecture on the teaching of midwifery, delivered last year, stated that public opinion in England has at last been roused because of the fact that the maternal mortality and morbidity in the British Isles had not been lowered for the last twenty years, a statement which cannot be made about any other medical condition or disease. He places most, if not all, of the blame for this on the very inadequate teaching of midwifery and the diseases of women. He writes: "Midwifery and the diseases of women form one-third of all qualifying examinations for the medical student, and it is perhaps the most important of all three parts dealing, as it does, with the well-being of those who supply the nation with citizens. Again, for some reason which its teachers can never understand, midwifery has always been regarded as a specialty in the hospital world and probably also in the minds of the lay public. It is no more a specialty than medicine and surgery, forming as it does one of the Trinity of medicine. The Medical Act draws, and knows, no difference between medicine, surgery and midwifery."

I believe there can be no doubt that the inadequate teaching of obstetrics in most of the medical schools of our country is the largest single factor in the production of that high maternal mortality; and it is only by an extension and improvement in the teaching of this branch of medicine that we can ever hope to reduce this overwhelming death rate.

From this, you will observe how intimately bound together are the first two functions of a woman's clinic, the care of patients and the teaching of students. We can only hope to improve the medical care of patients and reduce the risk incident to pregnancy by affording better teaching facilities and by graduating men and women better trained in obstetrics and the diseases of women. I am not a believer in the argument that the student must obtain his experience after graduation as he does in medicine and surgery. While a student, he now gets more training in these last two than in obstetrics and gynecology, and yet he may need his knowledge of obstetrics far more urgently immediately after graduation. To quote Berkeley once more: "It appears to be forgotten or perhaps not realized, that the position of midwifery, qua the newly qualified man, is entirely different from that of medicine or surgery. General practitioners, as a body, do not practice surgery, but call in a surgeon or send their patients to a hospital. In the case of a medical disease, the practitioner has, in nearly every instance, time to turn around, and if necessary he can call in a physician or send his patient to the hospital. On the other hand, the first day a medical man is in practice, he may be 'up against' a midwifery complication which requires his immediate attention if the life of the woman and her child are to be saved, and in which there is no time to wait for the assistance of an expert. It seems to be forgotten, more often than not,

that an obstetrician is dealing at the same time with two lives, while the physician or surgeon is dealing with one at a time only." In this, I agree fully with the writer, and also when he concludes that our universities should extend the time allotted to the teaching of obstetrics and gynecology to equal that given in either medicine or surgery.

I shall now discuss under separate headings the three functions of a university woman's clinic; the care of patients, the teaching of students, and the fostering of research.

CARE OF PATIENTS

The most important function of a woman's clinic is to provide adequate nursing and medical care for all admitted to public ward or private room. It may be noted here that the Woman's Clinic of the New York Hospital-Cornell Medical College Association will have 112 public beds out of a total of 138 obstetric beds, and 32 public ward beds out of a total of 42 gynecologic beds. From these figures you will observe the very limited space allotted to private patients, amounting to only 26 out of a total of 170 beds, or about 15 per cent of the total capacity.

Under the full-time scheme, the chief of the clinic and a small number of assistants spend their whole time at and in the interests of the clinic. The running of a large woman's clinic, together with teaching and a certain amount of individual research, consumes almost, if not all, the time of the chief; and he thus has very little time to devote to private practice. I have held a full-time position in medicine for the past eight years, and know this to be the case. Full-time medicine was founded with the express purpose that the head of a department and a few assistants could give all their time to the details of the clinic, teaching and research. The chief of a university woman's clinic, therefore, should be interested primarily in these three functions, and any private patients that he may have should constitute a very small number, and take up a decidedly minor part of his time. This, of course, also applies to his few full-time assistants.

It is my idea that in the care of patients, that is, the clinical aspect of the clinic, the burden must be borne by part-time as well as full-time men. The reasons for this are that the full-time staff is too small to adequately handle a large clinic; and secondly, and perhaps of more importance, that it would lead to stagnation if a fairly large group of men, including those in private practice, were not utilized in this prime function of the clinic.

TEACHING

The medical student, the graduate who wishes to prepare himself for the practice of obstetrics and gynecology, and the practitioner who wants to spend a few weeks or months in the clinic, constitute the group

that must be taught. I agree with my present chief, Dr. Williams, that it is the duty and privilege of a university clinic to foster the teaching of the first two groups, and that the third group who wish to take postgraduate courses, should be referred to specially devised postgraduate schools. This, of course, does not mean that the general practitioner will not be welcomed to spend a few days in the clinic; but regular courses or work solely designed for his benefit had better be given in these special postgraduate schools.

Here again, in the teaching of medical students and graduates, the full-time staff urgently needs the help of the part-time specialists. The teaching can be broadened, improved and made of greater interest, by the utilization of the part-time men on the staff. The major part of the teaching, however, must be cared for by men who can give their whole and undivided time to the preparation and carrying out of this task.

RESEARCH

It is not necessary that I emphasize the many problems in obstetrics and gynecology which are in urgent need of solution. The etiology and treatment of puerperal infection, the toxemias of pregnancy, the nature and cause of menstruation, the endocrine and metabolic changes associated with the menopause, the cause of labor, the etiology of most spontaneous abortions, the best methods of treatment of many abnormalities appearing in the third trimester of pregnancy, the etiology of uterine displacements, as well as of benign and malignant growths of the female reproductive system, represent a few of these problems. For the solution of many of these questions, the investigator, in addition to being a competent clinician, must be trained in one or other of the fundamental biological or physical sciences, must possess the facilities and be prepared to devote a considerable portion of his time whole-heartedly to the question in hand. For this purpose again a full-time staff consisting of properly trained men is essential. This, however, does not imply that the university clinic should not welcome and afford opportunities to men engaged in private practice, who have the urge, the training and the time to pursue an original investigation.

I wish to emphasize here that the object of research in a woman's clinic is to solve, or attempt to solve, problems with a direct clinical bearing, as the more academic or pure scientific questions can far better be studied in the preclinical or academic departments. In order that a real bedside appreciation of problems may be had, and that the proper critique as to the solution and application of such questions may be exercised, it is essential that the staff of the clinic be composed of clinically well trained men with a knowledge of one or other of the basic sciences. It would lead to greater efficiency both clinical and experimental, and to more valuable productivity were the staff to be

composed of first-rate clinicians, each one well trained in a different fundamental science, so that anatomy, embryology, bacteriology, pathology and chemistry were all duly represented in the clinic. This is an ideal state toward which we can only hope to strive.

In concluding these remarks, I cannot refrain from commenting upon perhaps the most universal criticism of full-time medicine, which is, that the men on the full-time system are usually poor clinicians. This criticism is undoubtedly valid in some instances, but we must not forget that the system is still young, and passing through its experimental stage. It is not always an easy matter to procure men with long clinical experience who are imbued with university ideals, possessing the necessary fundamental training and willing to sacrifice a lucrative practice and assume the leadership of a large university clinic at a moderate salary. Then, also, it is well to remember that many years of private practice in obstetrics does not necessarily mean a vast experience and thorough training in the abnormalities and difficulties of the specialty. A young man on the active full-time staff of a well run moderate sized woman's clinic will see and do more abnormal obstetrics in a year than his confrere in private practice in perhaps five years, or more. It is not so much the number of years spent, as the amount of material observed, thoroughly studied, and well treated, which is the basis of sound training. To my mind, the fact that the man has schooled himself prior to his clinical training in such exact sciences as biology or bacteriology, would enable him so much the better to master his clinical work. By this, I do not mean that "laboratory men" should constitute a full-time staff, but I do insist that a training in a fundamental science is no contraindication to sound clinical training. The full-time staff of a university woman's clinic certainly has an unusual opportunity to acquire clinical proficiency.

It is also well for us to bear in mind that the only excuse for full-time medicine is to produce better doctors in every sense of the word; and if this is not accomplished, then the full-time system is a failure. We have enough faith in the system to give it a fair and thorough trial, and certainly welcome constructive and helpful criticism; but criticism engendered from personal animosities and jealousy will benefit no one.

There is one last criticism directed toward the full-time medical man, and that is that he does not possess that "indefinable something" gained from contact with private patients on the outside. Today, most, if not all, of our obstetric patients are delivered in hospitals, and certainly our operative gynecologic patients are treated in the hospital. If the full-time man is conscientious (and we can lay down no rules for those who are not), he will treat his limited number of private patients as well as the private specialist treats his. He will come in as close touch, and I speak from first hand information, with his patients as does his

associate in strictly private practice. But, whether we discuss the clinical ability or the experience gained from private patients, in the end it is the individual rather than the system of training that counts.

From the foregoing remarks on the prime functions of a university woman's clinic, it must be clear to you that such a clinic differs radically from the lying-in hospitals, maternity hospitals, and women's hospitals that are founded along purely humanitarian lines, and not at all, or only indirectly, concerned with the education and training of medical students and graduates, and are not designed, equipped, or endowed for research. There will always be a place for these latter institutions, but it is fervently hoped that the universities throughout our country will follow the lead of the few medical schools, in which we are now happy to include the New York Hospital-Cornell Medical College Association, that have seen the light and followed, although somewhat tardily, the example of the great German universities with their "Frauenklinik" or Woman's Clinics.

THE DETECTION OF IMPENDING INTRAUTERINE DEATH*

By R. S. Titus, M.D., F.A.C.S., Boston, Mass.

THIS subject sounds very ambitious, and perhaps it is. Without ambition, however, we would stagnate, even in obstetrics. This paper offers no panacea for stillbirths, but it does aim to save a few babies that are now being lost. The saving of these few babies it hopes to accomplish by more intensive and intelligent prenatal care after the period of viability. It hopes to stimulate observation and appreciation of what one observes, and the knowledge that these observations may mean impending intrauterine death.

The number of cases that fall within the scope of this paper is actually very small, for in the first place we must rule out all those deaths which occur before viability. It is of academic interest to make the diagnosis at this stage of pregnancy of impending intrauterine death but of no practical value. In the second place, it rules out all stillbirths rightly attributed to poor obstetrics, passive or active, and it seems to me that almost as many stillbirths may be due to unintelligent procrastination as to over-zealous interference. In the third place, it rules out, as having nothing to do with this paper, all cases of stillbirth due to congenital abnormalities, hydrocephalus, anencephalus, congenital heart, kidney, and the like. In the fourth place, it rules out cases due to syphilis. The proportion of stillbirths due to syphilis is being decreased all the time by more intensive antisyphilitic treatment before pregnancy occurs and during pregnancy.

*Read at a meeting of the Boston Obstetrical Society, November 18, 1930.

The large proportion of stillbirths attributed to syphilis noted in the reports of many large lying-in clinics I am sure would be much decreased if antisyphilitic treatment could be instituted as it is in private practice. In the fifth place, it rules out all cases of stillbirths occurring during febrile states, such as pneumonia, typhoid fever, and the like, for in these cases induction is never justifiable, because of the mother's illness. Pyelitis here is an exception, for induction done in the interest of the mother may relieve the pyelitic attack and so indirectly save the baby's life; but here the living child is a gratifying side issue. I make no mention, because it seems to me irrelevant, of those deaths classified by some writers as stillbirths which occur in the first week or so after delivery, which are due to trauma of delivery. These, of course, in no way will come in the scope of this paper. And so, if one peruses the tabulated statistics of stillbirths, one will find, by the process of elimination, that very few of these stillbirths can in any way interest us.

There are, nevertheless, some few stillbirths which definitely do come under the comprehension of this paper: namely, those associated with toxemics, diabetics, nephritics, and the well-recognized patient who habitually starts in labor not long after the eighth month, and delivers herself of a dead baby. The number of such cases, of course, is small, and the number possibly preventable is smaller; but I do believe that by intelligent observation after the period of viability we may appreciate that the signs of a normally developing uterus are not present, and that in some of these cases, interference at a time when viability is compatible with life may save some babies otherwise lost. Of course one must make due allowance for the lowered height of the fundus in those cases in which the presenting part is settling.

If we are to detect impending intrauterine death, all cases beyond seven months should be given more intensive prenatal care than is now often practiced. Certain cases are more prone to disaster, but all women beyond this stage are deserving of our best attention. The office visit after this time should be a more frequent one; perhaps a two-week interval is none too frequent. Palpation is of the greatest importance. We all know that the healthy, normally developing fetus grows unceasingly, and this growth is shown in an increase in the size of the uterus. This size should be noted carefully at each visit, and absence of growth or retrogression in size at any time shows that the uterine contents either are not growing or have shrunken. If the fetal heart is present, we know the baby is still living. If the fetal heart has ceased, we know the baby is dead, and our observation is of no practical value.

Weighing patients is of inestimable value all during pregnancy and particularly at this time. The amount of weight that any given patient should gain, I think, depends entirely upon the patient. I think

it is perfectly possible for an extremely fat woman to actually lose weight during pregnancy, but the ordinary case should gain at least one-half pound a week. A marked increase over this weight may mean twins, edema, hydramnios, a very large baby, or, more commonly, an unnecessary increase in bodily weight. An absence of an increase in weight, especially with the appearance of edema, or a marked diminution in weight means, if there be no reason for the loss, such as an intercurrent infection, that the intrauterine contents are not developing. The appreciation of the nongrowth of the uterus, with a present fetal heart, with a loss of weight or a lack of increase in weight, at a time in pregnancy compatible with viability, should always arouse our interest and bring up the question of interference; and if this patient be well in the limit of viability, I am certain that induction will save some babies that procrastination will lose.

Now, a few words as to the handling of those patients in whom we should appreciate that the occurrence of intrauterine death after viability is most common. I have reference to diabetics, nephritics, toxemics and the mother who delivers herself habitually of a dead baby not long after eight months. Insulin has changed the treatment of diabetics so remarkably that all our views regarding diabetes in pregnancy must be altered. Ten years ago pregnancy occurring in severe diabetics was such a serious burden that abortion was a frequently advised operation. It is safe to say today that diabetic patients who have the same degree of severity, may much more safely undertake pregnancy and will, carefully and intelligently handled, have a perfectly good chance of a living child, with very little danger to themselves. The diabetic patient should not gain too much weight. The few that I have handled I am sure have been better when their gain in weight has been constant but small. It has long been recognized that diabetic patients are apt to have big babies and that not infrequently they deliver themselves at term of big babies that are macerated; and so in the handling of these diabetic patients I feel that they should be seen alternately by the diabetic specialist and by the obstetrician each week during their entire pregnancy, that their weight should be carefully noted, that their blood sugar should be done each week and that the uterus should be palpated and its growth recorded. I feel too that after eight months diabetic patients should be hospitalized, that their blood sugar should be done daily, that they should be weighed daily and that the uterus should be palpated daily; and that the presence of edema and the presence of albuminuria should be recognized in these diabetics as of extremely serious prognostic significance. It is only in this way, I think, that the shrinkage of the uterus or its nonincrease in size will be noted in time to prevent the delivery of a macerated baby.

In regard to toxemic patients, it has not been customary to induce labor in toxemic patients except when toxemic mothers were becoming more sick; in other words, the induction of labor has always been for the benefit of the mother. I feel certain that there are many toxemic babies that might be saved by induction if more systematic, intelligent observation of the uterus were practiced. I have one case to report, a toxemic patient who was not sick enough to be delivered and in whom I made a diagnosis of shrunken uterus. Labor was induced, and a baby weighing 3 pounds 10 ounces was delivered. This baby was about ten days short of term, and it was not until it was getting food that a 7½ pound baby would normally require that it was at all satisfied. I think that toxemic patients should be seen more frequently and many of them should be hospitalized and observed as I have suggested, if we are to get the occasional case with a present fetal heart and decreasing size of the uterus in time to interfere before intrauterine death results.

What has been said about toxemic patients applies perhaps more truly to nephritic patients. It has long been recognized that the woman with moderately severe nephritis may go to eight months or beyond with a living child, only subsequently to have that baby delivered dead. I believe that those nephritic patients who are allowed to continue pregnancy for the sake of a baby should be hospitalized as soon after seven months as the individual case seems to warrant. I think they should be watched most carefully, because we know that oftentimes with the intrauterine death of the baby the amelioration of their nephritic symptoms takes place. With diminution in the size of the uterus and actual loss of weight as far as the mother goes, and where the case has progressed far enough to be compatible with viability, in the presence of an active fetal heart, I feel that induction will save some children which delay will lose.

What has been said about nephritic patients holds true almost word for word for those unfortunate women who carry living babies for eight months or a little more. Maybe some of these are nephritic patients, but certainly there are some who show, with clinical and laboratory tests, no symptoms of nephritis whatsoever. I have one patient now who has two living children and who has had two dead babies, one at seven and one-half months and one at a little over eight months. Her Wassermann was negative, all her kidney tests were normal, she had a normal blood pressure and I am told that during her previous pregnancies she showed no albuminuria. Soon after seven months I shall insist upon hospitalizing her, I shall watch her carefully day by day, and at the first suggestion of a decrease in the size of the uterus, if the fetal heart is still present, I shall induce labor.

In support of this contention that the diagnosis of impending intrauterine death is possible, I shall briefly review the following cases.

In some the appreciation of impending death occurred at a time when interference would have resulted in no material gain. In another a living child was obtained more by the grace of God than by my foresight, for, although I realized that the uterus had shrunk, I did not have sense enough to deduce what it meant. Another case was that of a diabetic patient, and in this case a macerated baby was delivered, which would have been saved had induction been instituted when it was appreciated that the uterus was not growing.

CASE 1.—Para i (1018), thirty-three years old, due the early part of November. Patient had had a very stormy past history, was away for a long time with tuberculosis, had had pleurisy, had been operated upon for duodenal ulcer. She had a rather uncomfortable pregnancy, with more than a normal amount of indigestion. She started her pregnancy weighing 117¼, which was a bit more than her normal weight. Her weight increased slowly until on the thirtieth of September, six months after her first visit, she weighed 136 pounds. On the fourteenth of October she weighed 138½ pounds and on the twenty-first of October she weighed 138½ pounds, there being no gain in weight in a week. At this time the uterus was small, it was a small baby, and the head was at brim. Both her urine and blood pressure remained normal. When I saw her at home on the twenty-eighth of October my comment was that the baby had fallen, because the uterus seemed smaller. The fetal heart was distinct but the vaginal examination showed the head nowhere near the pelvis. I did not then appreciate what all this meant. A week later, on the fifth of November, the patient started in labor and a section was done because of bleeding due to a separated placenta. The baby weighed four pounds. On examination of the placenta it was perfectly evident that the baby was getting only enough nourishment from the placenta to maintain life. The baby certainly would not have lived if left to vaginal delivery. In this case I realized that the uterus had not grown but I did not appreciate its significance. The living baby was a result of kindness on the part of nature, not due to any foresight of mine.

CASE 2.—Para ii (1823), forty years old, due the twelfth of April. Pregnancy progressed normally, increased in weight gradually. At the time of her first visit, the fifteenth of August, she weighed 120¼, on the nineteenth of February she weighed 145½ and on the twelfth of March she weighed 146¼, which is a gain of only ¾ pound in thirteen days. In the meantime, however, she developed a good amount of edema, the uterus was distinctly smaller than on her previous visit, her blood pressure was 130/80, and her urine showed a trace of albumin. She was, therefore, induced by rupture of the membranes on the twenty-eighth of March, and a baby, long and thin, which weighed 3 pounds 10 ounces was delivered. The placenta showed a definite area of infarction. Her first baby weighed 7 pounds 10 ounces.

CASE 3.—Para iii (1795), thirty-five years old, baby due the twenty-second of November. Diabetes had been discovered during her second pregnancy, five years previous to my seeing her. She had had one full-term baby and one stillborn baby at seven months. This patient progressed normally as far as her diabetes was concerned. Her gain in weight was slow and gradual. She began to develop edema in September. She weighed 131¼ on the eleventh of October and 130 on the twenty-fifth of October. On the eleventh of October the baby seemed small with a lot of water; on the twenty-fifth of October the uterus was distinctly smaller. The fetal heart was distinct and her blood pressure was 110. On the seventh of November the uterus seemed smaller and certainly no bigger than at her previous visit. The fetal

heart at this time was distinct. A few days later the patient telephoned that she thought that she had not felt the baby and when I saw her subsequently the baby was definitely dead. She delivered herself of a macerated fetus a week after that. In retrospect, I believe that if I had delivered her when the uterus began to shrink a live child would have been delivered. I have learned something but the experience is bitter.

CASE 4.—Para iii (1472), thirty-two years old, due the twenty-fifth of March. Patient had two normal children. On the twenty-first of February she weighed 157¼ and one week later she had gained a quarter of a pound. The uterus seemed to be growing little, if any, probably none. The fetal heart was distinct. Her urine specimens were all negative. On the thirteenth of March it was perfectly evident that the baby had died. There was no fetal heart and the uterus was distinctly smaller. An x-ray was taken which confirmed my diagnosis. The patient was induced and a macerated baby was delivered.

CASE 5.—Para iii (1672), thirty-four years old, due the seventh of May. Pregnancy progressed normally until the end of February, previous to which time she had had the grippe, and on the twenty-first of February she came in to see me, feeling rather poorly. The uterus at that time seemed all right, she weighed 142¼ pounds, her blood pressure was 122/60, and she had no edema. On the thirteenth of March, three weeks later, the uterus did not seem to me to have increased in size at all. The patient, however, had increased in weight. There was a question about the fetal heart. I felt then that there was something wrong with the pregnancy. A week later the patient delivered a macerated fetus.

CASE 6.—Para ii (1684), twenty-seven years old, due the nineteenth of April. The patient was seen first the eighth of October, at which time the uterus was three months in size and everything was as it should be. On the twentieth of November there was some question about the size of the uterus and on the ninth of December the patient had a small amount of discharge of blood and the uterus had distinctly decreased in size. This, of course, has no practical bearing but shows that the decrease in size of the uterus may definitely be noted.

In conclusion, I think that impending intrauterine death may be detected in a small number of patients and that the number of cases in which this is possible is necessarily small. Most of the cases will occur in diabetic, nephritic, and toxemic patients, and in the eighth-month habitual miscarrier. I believe that the possibility of detecting intrauterine death before it occurs depends upon more active, more intelligent prenatal care, more frequent office visits, hospitalization in certain patients after the period of viability. I believe that the nongrowth or the shrinkage of the uterus and the presence of a decrease or no increase in weight are the significant signs which point to impending intrauterine death. I believe that these signs should stimulate us at least to the consideration of the need of induction, and I believe that a certain number of babies now lost might be saved.

472 COMMONWEALTH AVENUE.

(For discussion, see page 451.)

THE CONTRACTIONS OF THE MONKEY UTERUS AT TERM

By A. C. Ivy, Ph.D., M.D., Chicago, Ill., Carl G. Hartman, Ph.D., and Arthur Koff, M.D., Baltimore, Md.

(From the Department of Physiology, Northwestern University, School of Medicine, Chicago, and Carnegie Laboratory of Embryology, Baltimore)

NOTABLE progress has been made during the past quarter century in the physiology and pharmacology of the smooth muscle of the visceral organs, especially the gut. Numerous methods have been employed, including the oldest, that of direct observation. In the female the musculature of the genital tract has been the subject of numerous studies to elucidate the factors involved in the transport of the egg through the tube, their spacing in the uterine horns in the case of multiparous animals and, from a practical standpoint most important of all, the behavior of the organs in the expulsion of the fetus at birth. The method of direct observation through windows placed in the abdominal wall of rabbits (Wijsenbeek and Grevenstuk, 1922) has led to important contributions to the physiology of the uterus as seen in situ.

Recently Rudolph and Ivy (1930) studied the behavior of the uterus, cervix, and vagina in the dog and the rabbit during parturition. The method was chiefly that of direct observation. As soon as the animal was seen to be definitely in labor, it was placed under light ether anesthesia, the abdomen opened, the uterus with its chain of ampullae, or embryonic chambers, laid bare. It was found that the lowest ampulla engaged in strong contractions first, the remainder of the uterine horns remaining more or less quiescent. The fetus is advanced both by a strong cylindrical band of circular contractions, that spread downward, and by a longitudinal shortening. The retreat of the fetus is prevented by a persistent longitudinal contraction or "retraction." The evacuation of the fetus from the ampulla is analogous to the evacuation of the colon in the dog in every respect except that it occurs at a slower rate. The fetus next passes into the corpus uteri, which is now dilated by the presenting part. By a contraction of sphincters at the junction of the horns and the corpus uteri and the circular fibers at the vault of the latter, the fetus is expelled through cervix and vagina and by the latter, as well as by the contraction of the abdominal walls, to the outside world. The placenta is loosened by a natural Credé, namely, marked contraction of the longitudinal muscles which greatly shortens the ampulla and renders it a passive birth canal for the fetus next in line.

Stimulation of the hypogastric plexus and the nervus erigens Rudolph and Ivy found gave results that lacked uniformity, hence they

concluded that the extrinsic nerves of the uterus play a subordinate rôle in parturition. Epinephrine acts inhibitorily on spontaneous contractions and decreases or abolishes the action of pituitrin as well as that of gynergen. Intrauterine pressure resulted in a rupture of the corpus uteri, which suggested to the authors that the lower segment of the human uterus is homologous to the body of bicornuate uteri as found in carnivores, rodents, and other orders of mammals. The present paper offers an interesting confirmation of their view.

Interesting as these new results appeared, they yet fell short of direct applicability to the human condition because of the palpable differences between the human uterus and that of the laboratory mammals. Opportunity presented itself at the Carnegie Colony of rhesus monkeys to apply Rudolph and Ivy's method of study to the parturient monkey uterus. The experiments proved encouraging and, while still far from complete, gave results which it is thought would interest the student of comparative obstetrics. We can now state, for example, just how the wave of contraction passes over the simplex type of uterus which characterizes man and primate animals. We wish also to present views on the homology of the part of the uterus of primates and other mammalian orders as based on the new physiologic data. Some further experiments on the effect of drugs are included.

Two animals were used. Their histories are given below. It is seen that both were multiparae and practically at term.

PROTOCOL OF NO. 117

Female No. 117 was received direct from India, April 12, 1930, with a batch of two dozen mothers nursing yearling babies. She, too, although she failed to claim any baby of the group, had been nursing within some weeks, for small drops of milk were still expressible from the breasts. April 30, palpation showed the baby's head to be the size of an egg, dead and slightly softened. Normally an embryo attains this size about the sixteenth to seventeenth week of gestation; and if we assume that the baby had been dead in utero for three weeks, we have a gestation period of about twenty weeks; but it may have been more. The experiment took place May 8, the beginning of the estimated twenty-second week. We have had a viable baby born as early as this estimate; so we may assume that the uterus was well prepared for the expulsion of the fetus, especially since, at the time of the experiment, the contents of the ovum were macerated into a shapeless mass.

PROTOCOL OF NO. 78

The history of female No. 78 of the Carnegia Colony is a brief one. She was received September 11, 1929, and conceived two months later. A slight bleeding occurred September 13, October 9 and 11, November 8, the intervals or cycle lengths being twenty-six and thirty days respectively. A mating with male I day 10 of the October cycle proved ineffective. Early in November she received an ugly scalp wound and was placed in a paddock with male B, an adolescent. The actual day of conception can only be estimated from the day of appearance of the placental sign. Calculating back sixteen days from the date of its first appearance we set the day of conception on November 23. This we know from experience with numerous pregnancies cannot be far from the truth.

By rectal bimanual palpation the progress of the gestation was followed. On May 8, the one hundred sixty-ninth day of gestation, or four days over the average duration of gestation, parturition had not yet taken place. These conditions combined with the injured scalp lead to the selection of this animal for the experiments recorded below.

METHOD

The subject was tracheotomized and kept under the ether as lightly as possible. Thus, No. 117 consumed only 60 c.c. of ether out of the ether bottle in ten hours. The abdomen was opened and the uterus exposed for direct observation of the contractions. These were observed and recorded for several hours before the uterus was touched or subjected to chemical or nervous stimulation. Motion pictures were also made from time to time. These turned out to be, from the nature of the subject, difficult to read; but when seen repeatedly they convey a fair picture of the contraction waves that pass over the organ and are useful in checking up the results of direct observation. This was done by all three of us and written up independently, and the notes compared and agreement reached on all essentials. The subjective element was thus reduced as much as possible.

After several hours of observing the intact uterus in this way, various means of stimulation were employed: mechanical, as by pushing the finger into the wall; faradic stimulation of the extrinsic nerves, injection of pitocin, epinephrine, or ergotamine tartrate. The uterus was then emptied of its contents and a double balloon (Diagram 1) inserted (Fig. 6) in order to record the effects upon the

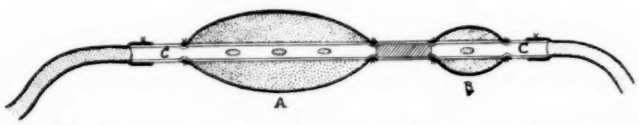


Diagram 1.—The balloon arrangement used to make a graphic record of the movements of the postpartum uterus. *A*, the balloon placed in the fundus; *B*, the balloon placed in the cervical sphincter. A nonflexible tube *C* was used in order to keep the balloon in a permanent position.

smoked drum. One balloon recorded the contractions of the uterus, the other of the cervix. This was especially successful in the second specimen. No. 117 was delivered by an incision through the fundus; in the second case (No. 78) the baby, in breech presentation, was delivered per vaginam. The difficulties experienced in extracting the head because of the excessive contractions of a powerful sphincter in the region of the internal os (Fig. 2) was surprising, inasmuch as so great resistance was not expected in so small an animal. In the second case also an incision was made in the fundus for the insertion of the balloons.

THE CONTRACTION WAVE

The contraction wave of the human uterus intrapartum has probably not yet been observed. The reason for this is that during cesarean section the incision is made too small to view more than a small portion of the uterus, combined with the natural inhibition which the visceral organs suffer upon first exposure to the atmosphere. There is probably, therefore, here presented for the first time a description of the behavior of the parturient uterus of one primate.

Inasmuch as the conditions in the two animals were somewhat different, No. 117 containing a macerated fetus and placenta, No. 78 a living baby and intact placenta (Fig. 7), the two cases will be described separately.

No. 117.—Typically, the contraction wave in No. 117 began at both corners of the uterus (the "pace-makers") ventral and cranial (approximately 1.5 cm.) to the insertion of the tubes and passes in ever widening concentric waves, elliptical in form, forward and medially until the waves meet in the midline. They often travel caudally, along the midline, involving a longitudinal shortening of the lower segment, following which there occurs a circular contraction originating near the line of insertion of the round ligaments (Fig. 6), associated with some longitudinal shortening of the uterus in this region. The entire process may consume three to eight or more seconds.

Occasionally one "pace-maker" only would be involved, as shown by blanching on one side only and bulging of the uterus at the opposite side. Such a wave may pass entirely over to the opposite side or die out in the midline. But such unilateral action is exceptional. Mechanical stimulation at the lower part of the lower segment caused a reversal of the wave, as did stimulation of the hypogastric plexus. The latter, however, usually caused a normal contraction, sometimes involving only the dorsal aspect of the organ; but stimulation of the nerves seemed to have a deleterious effect upon the muscle since the spontaneous contractions became weaker and less frequent.

The "pace-maker" is usually quite red, that is, relaxed, hence does not itself participate in the contractions described.

No. 78.—In the case of No. 78 every condition seemed normal. As seen in Fig. 1 the uterus is dome-shaped, due to the primary placenta bulging up the ventral area; for it should be noted that this species of monkey has a double discoidal placenta, the secondary structure being supplied by blood vessels crossing the chorion from the primary. The placentas of No. 78 seen in Fig. 7 are exceptional in having but two connecting vessels where there are usually many (up to 15) between the primary and the secondary discs.

The contraction waves in the second experiment (No. 78) originated and traveled approximately as described in No. 117, with the exception that the placental areas were less affected by the wave of contraction. There thus resulted a coronal furrow about the upper segment due to shortening in the portion between the placental sites, which caused the placental area to appear like a raised plaque as stated above. As in the preceding cases there was an area about the insertion of the tubes, about 15 mm. in diameter, which failed to blanch during the contraction phase. Following the contraction of the upper segment the lower segment manifested a longitudinal shortening with some circular contraction as shown by longitudinal striae. The wall of the lower segment was palpably the thinner. With each contraction of the upper segment the breech was forced farther downward into the lower segment, causing distention of the latter. At the same time at the opposite pole, the head was outlined and formed a slight elevation, at which point the uterine musculature was more blanched, hence more violently contracted, due doubtless to the mechanical or "stretch" stimulus.

THE CERVICAL SPHINCTER

For most of its extent the cervix is an extremely soft, yielding structure at the end of pregnancy, as we know from fifteen or more cases palpated by the rectal bimanual method. This is what we would expect from Stieve's histologic study of the wall at this stage. However, at the level of the internal os there develops during pregnancy, a band which may be felt by the inserted finger as a definite ridge. It is visible externally as a band 4 to 6 mm. in width and may be well

1.

2.

3.

Figs. 1-3.—*1*, Lateral view of uterus showing the "relative inertia" of the placental sites and the "coronal" contraction of the fundus. The pencil marks the lower edge of the placenta. *2*, the postpartum uterus. *"a"* the upper segment. Note the arcuate tendency. *"b"* the lower segment. Note the longitudinal striae denoting contraction of underlying circular muscle. The pencil marks the location of the cervical band or sphincter, below which is the vagina exposed by pubiotomy. *3*, same as *2*, but showing a contraction of the upper segment to be followed shortly by a contraction of the lower segment.

seen in Fig. 2 at the tip of the pencil (also in Fig. 3, but not at the tip of the pencil).

The sphincter undergoes considerable excursion of contraction and relaxation, at times leaving the lumen dilated as much as a quarter dollar (2.5 cm.); then contracting down so that the finger can be inserted only with difficulty. The force of the spontaneous contraction is comparable to that of the cardiac sphincter of the stomach, but may at times be *much* stronger. Such is the usual behavior of the sphincter postpartum, as we know from palpation of many cases, a result which is in agreement with the observations of the obstetrician on the human mother.

The contraction of the sphincter was usually independent of the upper or lower uterine segment, i.e., it might contract when the lower segment was relaxed or vice versa. In a number of instances the digital dilatation of the sphincter caused a strong contraction of the fundus or upper segment which then travelled in a normal manner. The reverse of this, i.e., relaxation of the corpus uteri upon mechanical stimulation of the sphincter was not observed in the monkey, but was not looked for especially.

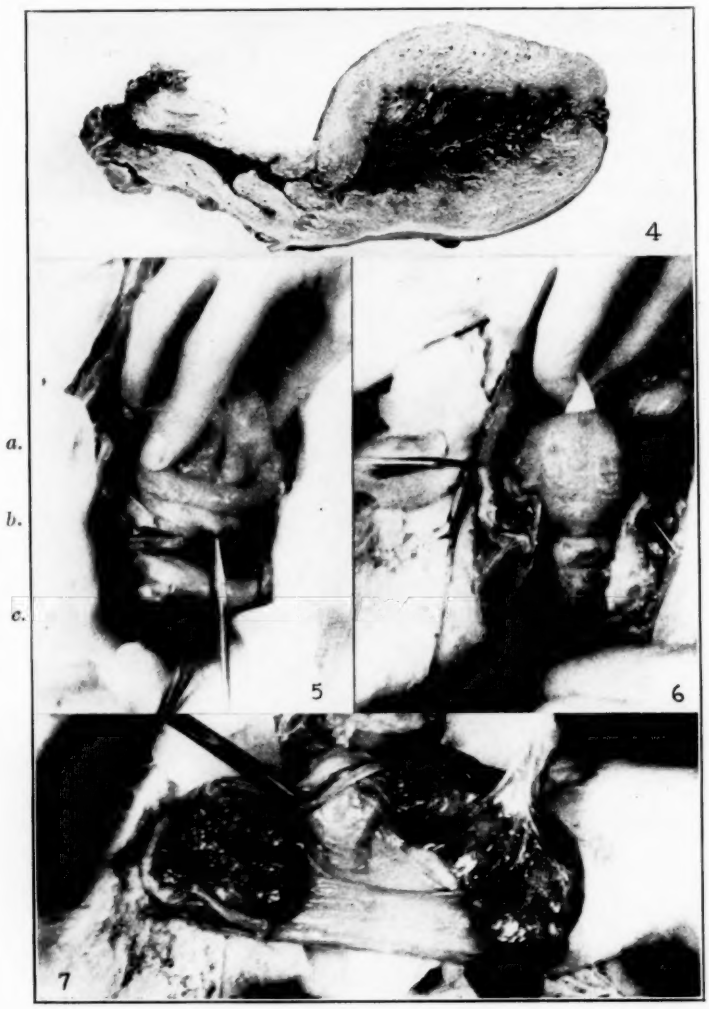
FORCIBLE DELIVERY OF BABY

Since spontaneous labor did not occur an attempt was made to extract it per vaginam. The baby, it should be recalled, was in breech presentation. During the procedure the sphincter was kept in view and was observed to exert a resistance far greater than could be accounted for solely on the basis of muscular action, although it is evident that such a sphincter has a decided mechanical advantage. Considerable difficulty was, therefore, experienced in the delivery of the after-coming head, which failed to pass until a tear occurred in the sphincter. If there is also a sphincter in the human being, we can see what care must be exercised to prevent strangulation of the baby in breech presentation, for the greater the pull the greater the "stretch" stimulus upon the muscle fibers of the sphincter.

During the manual delivery of the head the upper segment was contracted but not as markedly as it was just after the delivery was completed. Since during the extraction of the head the lower segment was handled, our observations concerning its activity do not apply to the normal.

The third stage of labor was also closely observed. After delivery of the head the upper segment contracted in the region of the insertion of the tubes, the contraction spreading to involve the placental site where it persisted as a prolonged contraction. The lower segment became markedly relaxed, being filled with placenta, and the sphincter remained visibly dilated, but because of the tear it could not be ascertained whether or not it contracted intermittently. After forty min-

utes' wait, traction was placed on the cord, which caused umbilication followed by strong contraction of the fundus. Twenty minutes later the Credé procedure resulted in delivery of the placenta (Fig. 5). The uterus immediately contracted in toto and became pear-shaped (Figs.



Figs. 4-7.—4, Sagittal section of the uterus. 5, Showing (a) Credé of upper segment, causing contraction of same, and (b) the lower segment dilated with the placenta and relatively relaxed, and (c) a portion of the placenta projecting from the vagina. 6, The uterus is markedly contracted due to the mechanical stimulation set up by the insertion of the balloons (white structure between fingers). 7, showing the double or duplex placenta immediately after birth. The pencil touches one of the two communicating vessels (vein and artery in juxtaposition in each case).

2 and 3); the placental sites being especially blanched, doubtless an adaptive mechanism for the control of hemorrhage.

In this behavior of the uterus in labor the lower segment does not remain a passive structure, it is really contracted firmly postpartum,

as may be seen by the pronounced longitudinal ridges of the postpartum organ (Figs. 2 and 3). When the fetus is partly in the vaginal canal, it functions to expel the fetus by contracting behind it, and remains relaxed when dilated by the presence of the placenta, contracting firmly after this is passed, throwing the surface into very characteristic ridges.

HOMOLOGY OF PARTS

It becomes a painful necessity to reopen a question which lovers of peace thought settled by gynecologists for thirty years, namely, the homology of the parts of the uterus. We may first consider certain terms that are in vogue in the literature:

(1) *Fundus*, that part cranial to the line joining the insertions of the tubes, a purely anatomical concept without special significance. (2) *Isthmus*, a histologically well-defined transitional part between cervix and body, which is drawn into the uterine cavity with the growing dilatation of the uterus in pregnancy and which yet remains free of embryonic envelopes. (3) *"Bandl's ring,"* anatomically nondemonstrable, seems to be clinically manifest in the so-called "hourglass" uterus, a phenomenon which we succeeded in imitating by injection of pitocin. "Braun's ring" and "contraction ring" are further terms used in the same connection. That there is great confusion at this point appears from Williams' discussion of the subject in his *Obstetrics*, and no wonder, when our ideas are based on several frozen sections only and these studied by different investigators. In the present study we shall use the term "contraction ring" tentatively to designate the dividing line between upper and lower uterine segment. (4) *Upper segment* and *Lower segment* we have adopted as valid divisions because it is possible to demonstrate them as physiologic units (see Fig. 2, "*a*," upper segment; "*b*," lower segment).

The distinctness of upper and lower segments is apparent from the respective behavior of the parts in the course of pregnancy. Hartman has found from palpation of the organs of numerous female monkeys throughout pregnancy that the lower segment softens faster than the upper, since it is not included in implantation, hence does not contain any part of the distending ovum, which for the first part of gestation lends firmness to the uterus. In this he corroborates for the monkey what obstetricians have known for the human female since the time of Hegar's important results.

In this connection we cannot avoid the temptation to speculate upon the problem of homologies between the bicornate uterus (of the dog for example) and the simple uterus of the monkey. Rudolph and Ivy (1930) have already expressed the view that the corpus uteri of the dog is the homologue of the lower segment in man. The present work on the monkey adds much to this conviction. The appearance of the lower segment of the monkey uterus immediately postpartum, when both segments are maximally contracted and the striae are prominent (Figs. 2 and 3), is most strikingly like the postpartum corpus uteri of the dog in the same stage. The contraction ring would thus become nothing else than the lower sphincters of the uterine horns, fused into one; the upper segment becomes the fused horns themselves. We may

add in passing that the rhesus uterus as well as that of other macaques still display, in their markedly arcuate uteri, the tendency to the bicornate condition.

MAMMO-UTERINE REFLEX

It is well known that placing the baby to the human breast causes uterine "after pains" in the early puerperium; this is thought to play an important rôle in the involution of the postpartum uterus. It was thought worth while to obtain definite evidence on this point in the monkey. The only experimental pertinent work known to us was that of Ivy (unpublished). He placed a balloon in the uterus of a parturient goat (1-3 days) and obtained uterine contractions on placing the kid to the udder.

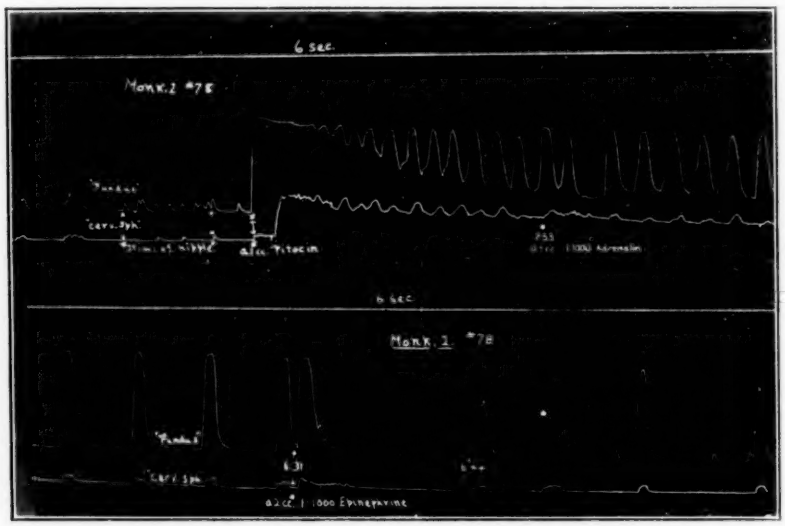


Fig. 8.—The upper tracing shows (1) the mammo-uterine reflex, (2) the action of pituitrin on the monkey's postpartum uterus, and (3) the inhibitory action of epinephrine.
The lower tracing shows the effect of epinephrine on the spontaneous contractions.

In both monkeys electrical or mechanical (milking) stimulation of the nipple caused contractions that were less vigorous than the spontaneous contractions of the uterus (Fig. 8). In monkey No. 78 each time the nipple was stimulated a nursing movement of the mouth and tongue resulted.

DRUGS

Since no one has reported observations on the effect of drugs on the uterus in vivo of the monkey, we decided to determine the effect of pituitrin, epinephrine, and ergotamine on the uterus of the two monkeys at hand.

The action of these drugs was observed by direct vision and photography prior to delivery and by graphic records from a balloon in the

postpartum uterus. The drugs were injected slowly intravenously during the period of one minute for the most part because of the time factor and the limited number of animals at our disposal.

Epinephrine.—Epinephrine in doses of from 0.1 to 0.2 c.c. of 1:1000 caused in both the anti- and postpartum uterus a single contraction followed by absence of contractions for a period of five minutes or longer.

Epinephrine also inhibited temporarily the contractions induced by pituitrin (Fig. 8).

These effects of epinephrine on the monkey's uterus in vivo were identical with the effects on the dog's uterus in vivo observed by Rudolph and Ivy (1930). The pharmacologic literature and possible clinical application of these observations are pointed out in their paper.

Pituitrin.—Pituitrin (0.1 c.c.) caused a marked and prolonged contraction of all parts of the ante- and postpartum uterus. This was followed by rapid intermittent contractions of gradually diminishing tone (Fig. 8), or without full relaxation between contractions.

The effect of pituitrin on the antepartum uterus of the monkey deserves a more detailed statement. Very soon after the injection, blanched areas at various points on the surface of the uterus appear, including the region of the round ligaments. This was followed by a circular contraction at the insertion of the round ligaments or the junction of the upper and lower uterine segments, which produced a definite "hourglass" effect, the lower segment being larger than the upper segment. This was followed by a contraction of all parts of the uterus, including the cervical band or sphincter, which converted the organ into the shape of a pear, the upper segment now being larger than the lower. This spasm of the entire uterus gradually disappears to be replaced by rhythmic contractions more rapid in rate than normal, which persist for twenty minutes. *It is very evident after watching the normal uterine movements, that the movements induced by pituitrin are little calculated to expel the fetus.* Epinephrine reduced the spasm.

It is obvious from this description of the action of pituitrin that in the doses used it markedly disturbs the coordinated and purposeful character of the uterine contractions. The various portions of the uterus respond at different rates as is shown by the blanched areas and the "hourglass" effect, which may be due either to a momentary variation in blood supply to these parts or to a variation in the susceptibility of the contractile mechanism of these parts to the action of pituitrin. The contraction ring which resulted at the junction of the upper and lower segments and which is regarded by us as homologous to the fundal sphincters of the dog, is significant, as is also the fact that the cervical sphincter contracts under the influence of pituitrin. Hence,

it is not surprising that obstetricians have occasionally experienced trouble on using pituitrin during labor and find that even when it is given at the end of the second stage the birth of the placenta may be delayed.

It might be objected that our doses were excessive, which we grant and assign reasons for above. However, it should be kept in mind that an "average dose" may in a susceptible uterine mechanism give the picture of overdosage.

Ergotamine.— Ergotamine and "ergotol" both caused a temporary augmentation of rate and amplitude of the uterine contractions. Their effect was surprisingly slight when compared to that of pituitrin. They produced no violent spasm and did not disturb the coordinated and purposeful character of the uterine contractions.

COORDINATION OF UTERINE CONTRACTIONS

The above description of the passage of the wave of contraction over the uterus as viewed by direct vision shows that the wave of contraction passes over the uterus according to a definite plan or sequence. Rudolph and Ivy (this Journal) in studying the dog found that a wave started near the insertion of the tubes and traveled over the horn and then onto the corpus uteri (lower segment).

Since the passage of the wave in the monkey was analogous to that in the dog, balloons were placed in the uterus so as to obtain a graphic record of the sequence of contractions. It was found that the cervical sphincter contracted from four to seven seconds after the contraction of the fundus started. This was timed with a watch and is detectable in Fig. 8 with difficulty because of the necessary reduction of the tracing. The chief point of this observation is that it shows that there must exist some kind of a coordinating mechanism in the primate uterus and that it is subject to physiologic study by the methods used by Rudolph and Ivy in the dog's uterus.

SUMMARY

1. The present study, while far from complete, records for the first time the manner in which the wave of contraction passes over the parturient uterus simplex of the monkey. Presumably a similar action characterizes the very comparable human uterus.

2. From a constantly quiescent area slightly ventral and cranial to the insertion of the tubes, elliptical, concentric waves of contraction pass medially to meet in the midline and cranial border of the uterus, passing caudally, then involving the lower segment and finally the cervix uteri.

3. Such contractions, after they reach the midline, follow the conducting bundle postulated by Hofbauer (1930) (not macroscopically demonstrable in the monkey). The contractions pass as we would

expect on the basis of the homologies outlined above as well as the embryologic development of the parts of uterus and tubes. The placental site is less involved by contractions than the remainder of the uterus.

4. The homologies referred to suggest that the lower segment of the primate uterus represents the corpus of bicornuate uteri; the upper segment the fused horns, the contraction ring, the cornual sphincters. This view is supported on both anatomic and physiologic grounds.

5. The musculature of the cervix is chiefly concentrated into a powerful sphincter at the internal os, which may be felt by the examining finger from the lumen side and may be seen externally (see Figs. 2 and 3). This sphincter is of the greatest obstetric importance, at least in the monkey. Upon delivery the uterus contracts maximally, forming the typical picture seen in Figs. 2 and 3. Contraction is greatest in the region of the placental sites, which further reduces the dangers of hemorrhage.

6. The pregnant and the parturient uterus are relatively nonirritable to nerve stimulation.

7. Stimulation of the mammary nipples causes a slight increase in the rate of the contractions.

8. Pituitrin (pitocin), in the dosage employed, causes spastic contractions over the entire uterus, followed by intermittent contractions without full relaxation. The contraction wave of normal sequence does not occur, hence the contractions after pitocin are little calculated to expel the fetus.

9. Adrenalin causes a primary contraction followed by temporary quiescence. It also abolishes the contraction due to pituitrin or ergotamine, the latter of which had only a mild action in the doses employed.

Wehefritz and Gierhake: The Urea Content of the Placenta. Arch. f. Gynäk. **339:** 479, 1930.

The authors find from their investigations that there is a temporary production of urea in the placenta and further that the placental urea content is usually high (11.7) under even the most normal conditions. This urea content is markedly increased in the more severe forms of toxemias of pregnancy. As may be surmised, the highest values are found in patients suffering from eclampsia. Here the urea content is increased to 50 mg. The authors therefore raise the question of placental poisoning due to such a heavy concentration of urea and discuss the effects of such a placental poisoning on both mother and fetus.

RALPH A. REIS.

LEIOMYOSARCOMA OF THE UTERUS, WITH A REPORT OF FOUR PERSONAL CASES*

By Samuel R. Meaker, M.D., F.A.C.S., Boston, Mass.
Professor of Gynecology, Boston University School of Medicine

IN EVERY clinic where operating-room specimens are routinely subjected to careful histopathologic study, a certain proportion of tumors clinically diagnosed as leiomyoma of the uterus are identified by the laboratory as leiomyosarcoma. While the incidence of this finding varies with different observers, the average of all reports indicates that about 1 per cent of supposed leiomyomas will show histologic malignancy.

It is obvious enough that no such percentage of uterine muscular tumors is malignant in the clinical sense. Neoplasms of this type do not metastasize and do not recur after removal, except in the rarest instances. Myosarcoma of the uterus is now, as it was before the days of hysterectomy, an exceedingly uncommon cause of death. Ewing states that in twenty years he has encountered only three cases of malignant uterine myomas with general metastases.

True myoma malignum, though rare, is nevertheless a well-defined clinical entity. It was first described by Virchow seventy years ago, and has been the subject of many later communications. This tumor metastasizes to remote organs, especially to the liver, lungs, kidneys, and lymph nodes; it tends to recur in the cervix after supravaginal hysterectomy; and it produces a cachexia which terminates fatally.

In most types of tumor the various grades and degrees of clinical malignancy run approximately parallel with corresponding histologic evidence. Leiomyosarcoma is an exception, in that tumors showing a considerable degree of histologic malignancy are often clinically benign. Only when the malignancy rises above a certain threshold does the growth burst its bounds and become an actual menace to life. It is, unfortunately, impossible to define that threshold. No one can distinguish a priori between the relatively harmless leiomyosarcoma and the true myoma malignum, though a clear distinction certainly exists. In practice, therefore, an attempt to differentiate histologic from clinical malignancy is unsound. Every leiomyosarcoma must be regarded and treated as a potentially dangerous neoplasm, even though it be well understood that the majority of such tumors are in fact relatively harmless.

*Read before the Boston Obstetrical Society, November 18, 1930.

PATHOLOGY

As regards gross pathology, the features of uterine leiomyosarcoma are closely similar to those of the benign myoma. Leiomyosarcoma occurs most frequently in the corpus uteri, and less often in the cervix. Its position may be subserous, interstitial, or submucous, and it may be encapsulated or diffuse. The tumors are single or multiple, and vary within wide limits as to size. Different types of degeneration are common.

From the microscopic viewpoint these neoplasms are characteristically cellular with great variation in the predominating type of cell, which is most often the round cell or the spindle cell. The general opinion among pathologists is that all mural uterine sarcomas are of myogenic origin, irrespective of the cell-type which is evolved. A criterion of malignancy is afforded by irregularities and inequalities of the size, shape, arrangement, differentiation, and staining-reaction of the cells, better perhaps than by such indications of simple rapid growth as mitotic figures, giant cells, scanty stroma, and newly-formed blood vessels.

In discussing the histopathologic picture, Ewing points out that ordinary myomas vary in structure in different portions and probably at different periods. "It must be considered that suspicious changes may not always be progressive, but may signify merely a temporary or local acceleration of growth which may subside and even regress. They do not seem to justify their designation as sarcomatous transformations, for which much more extensively altered areas or even general metastases might well be demanded. Sarcomatous tendencies and precancerous changes do not constitute real sarcoma or cancer." This sound but academic distinction cannot, of course, be safely taken as a basis for clinical procedure.

Leiomyosarcoma may develop as a primary tumor independent of benign myoma. Having so developed, it may secondarily invade a coexisting myoma. Some leiomyosarcomas appear to develop within preexisting myomas, but it is a question whether these result from genuine transformation of a previously benign growth, or whether such tumors actually possess a sort of latent malignancy from the beginning. It appears to me that the uncertainty upon this point justifies a somewhat radical attitude in the treatment of all uterine muscular tumors, even when they are not productive of symptoms.

DIAGNOSIS

A preoperative diagnosis of leiomyosarcoma of the uterus is rarely made, since the symptoms and signs of this tumor are practically identical with those produced by benign leiomyoma. Rapidity of growth is probably the most informative single datum: while slow-

growing tumors may or may not be malignant, those that grow rapidly are always worthy of suspicion.

Even at operation the recognition of leiomyosarcoma is by no means easy. Dannreuther has defined the distinguishing features as follows: (1) unusual friability of the broad ligaments; (2) remarkable vascularity of the tumor; (3) absence of a sharp line of demarcation between the tumor and the myometrium; (4) difficulty in shelling out the tumor from its apparent circumscribed limits; (5) an opaque appearance on section; and (6) an edematous and sparsely fasciculated appearance of the cut surface, which is softer than that of a fibromyoma. These careful observations undoubtedly provide the best standards at present available for the recognition of leiomyosarcoma by gross appearance. Nevertheless a larger experience than mine is required to apply them practically. With Dannreuther's standards in mind I have critically scrutinized every myomatous uterus seen at operation during the past two years. As a result I have been strongly suspicious of three tumors which proved to be benign, while at the same time I entertained no suspicion whatever in two cases of genuine leiomyosarcoma.

Only by continued attention to the problem of gross diagnosis will the judgment of the individual gynecologist become more discriminating. To this end it should be invariable routine, when hysterectomy is done for myoma, to open the uterus and carefully to examine the tumor before the pelvic wound is closed. Thus in a certain number of cases, at least, the patient will be given the benefit of reasonable doubt.

TREATMENT

Good results in the treatment of uterine leiomyosarcoma have been obtained by radiation alone, according to reports from certain European clinics. It would appear, however, that the most satisfactory treatment is radical operation, panhysterectomy with bilateral salpingo-oophorectomy, followed by deep x-rays.

When supracervical hysterectomy has been performed on a mistaken diagnosis of leiomyoma, the question of dealing with the cervical stump arises. Since myoma malignum commonly recurs in the cervix, I feel that there should be further treatment, preferably with radium, in all such cases.

REPORT OF CASES

During the two-year period 1928-1929 I found four leiomyosarcomas of the uterus in a series of 107 hysterectomies performed for supposed fibroid tumor. A brief report of these four cases is presented.

CASE 1.—Mrs. R. P., aged forty years, sought advice for amenorrhea and abdominal enlargement.

History.—The past history was good. Menstruation began at fourteen, and was regular and normal up until the onset of the present illness. She was married fifteen years, and had one child twelve years old.

For six months there had been complete amenorrhea, and for about three months the patient had noticed increasing enlargement of the lower abdomen. Slight constipation and variable pain in the left lower quadrant completed the tale of symptoms. There were no mammary, gastric, or vesical disturbances, and no hot flashes. Her own physician considered her pregnant.

Examination showed the uterus to be represented by a symmetrical hard tumor of the size of a five months' pregnancy, lying deep in the pelvis and movable only within narrow limits. A diagnosis of leiomyoma was made.

Operation proved to be difficult, for the tumor lay chiefly within the left broad ligament and had dislocated both the left ureter and the bladder. A subtotal hysterectomy with bilateral salpingo-oophorectomy was performed.

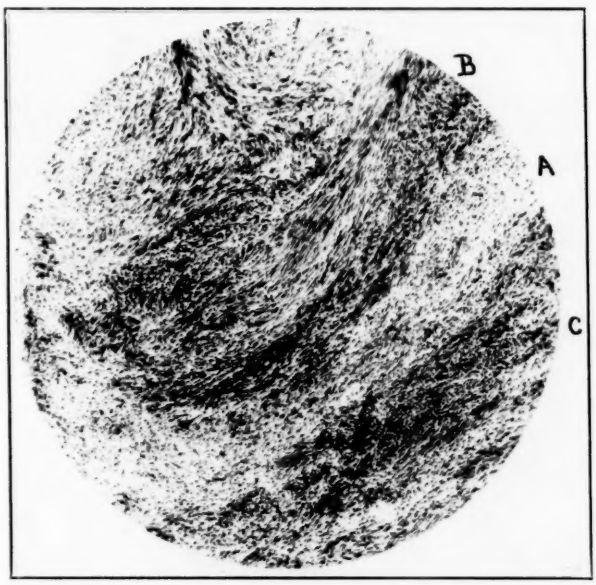


Fig. 1.—Section of tumor from Case 3, magnified 65 diameters. This low-power view shows a portion of the tumor capsule (*A*), the irregular growth of muscle-bundles in the leiomyosarcoma (*B*), and, by way of contrast, normal myometrium (*C*).

The immediate convalescence was uneventful except for superficial wound-infection. Several x-ray treatments were given. Ten months after operation the patient was in good health, and had gained ten pounds. A year later she died, the clinical diagnosis being malignant tumor of the lungs. Autopsy was not obtained.

*Pathological Report.**—The specimen is uterus, tubes, and ovaries.

The uterus is spherical in shape, 12 cm. in diameter, and shows no cervical portion. The serosa is dull yellow-gray in color, and smooth; the vessels are slightly injected. The myometrium is 0.7 cm. thick, and dull red-gray in color; it surrounds a spherical tumor-mass 10 cm. in diameter, yellow-white in color, for the most part firm, and with vessels markedly injected. One quadrant is definitely soft and mushy and contains much free clotted blood. The tubes are 7.5 × 0.2 cm. in size, moderately firm, and dull dark yellow-red in color; they show no gross pathology. The ovaries

*I am indebted to Dr. Charles F. Branch for the pathologic reports on these four cases, as well as for assistance in the preparation of photomicrographs.

are 2 × 1 × 0.5 cm. in size, pearl-white in color, and moderately firm; they show no gross pathology.

On microscopic section the soft portion of the tumor-mass in the uterine wall is found to consist of closely packed, deeply staining, rather elliptical cells, having little cytoplasm, being rather uniform in size, and presenting numerous mitotic figures. The walls of the fallopian tubes are densely infiltrated throughout with lymphocytes, plasma cells, and endothelial cells, but are apparently not distended and do not show any evidence of an acute process. The ovaries are not remarkable save that one of them contains a simple cyst lined by low cuboidal epithelium.

The pathologic diagnosis is rapidly growing leiomyosarcoma of the uterus, chronic salpingitis, and simple cyst of the ovary.

Comment.—This tumor was evidently a true myoma malignum, in which the histologic picture gave an accurate measurement of the clinical malignancy. Amenorrhea was a remarkable symptom, probably best explained as a menopausal phenomenon.

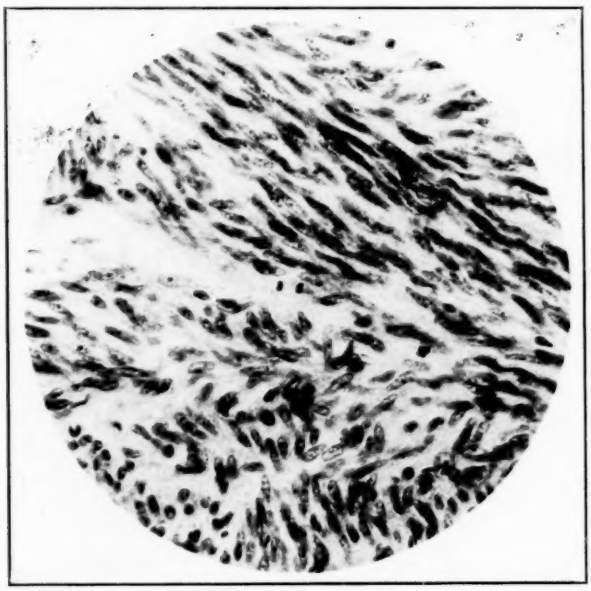


Fig. 2.—Section of tumor from Case 4, magnified 365 diameters. The cells show slight variation in size, shape, and staining-reaction. In the center of the field is a mitotic figure.

CASE 2.—Mrs. B. G., thirty-one years old, came to the clinic complaining of progressive abdominal enlargement.

History.—The patient gave an irrelevant past history. Her periods began at twelve years of age; they were always regular, moderate, and in every way normal. In twelve years of marriage she had borne four children, the youngest being three years old.

The sole complaint was a gradual steady increase in the size of the abdomen, noted by the patient for a year.

Examination revealed an abdominal tumor, smooth and resilient, extending from the symphysis to about 8 cm. above the umbilicus, and 18 or 20 cm. in width. Per vaginam nothing could be identified except the lower pole of this tumor, which seemed to be continuous with the cervix. X-ray showed no fetal skeleton.

Under spinocain anesthesia the abdomen was opened. The tumor was identified as a large leiomyoma of the uterus, and supravaginal hysterectomy with bilateral salpingo-oophorectomy was performed.

The patient made an uneventful recovery, and received several x-ray treatments. Eighteen months after operation she was free from all symptoms and signs of trouble.

Pathologic Report.—The specimen is uterus, tubes, and ovaries.

The uterus, lacking its cervical portion, measures 20 × 17 × 14 cm. It has been opened by the surgeon, and the tissues are stripped back to expose a tumor in the myometrium. The tumor is encapsulated, gray in color, moderately injected, and slightly soft in consistency. On section it consists of whorls and thick interlacing strands of gray-white tissue. The muscularis is 3.5 cm. in thickness, its fibers are yellow-gray, and the blood vessels are prominent. The uterine cavity is enlarged. The endometrium is 0.3 cm. in thickness, gray, glistening, smooth, soft in consistency, and slightly injected. The tubes measure 7 × 1 cm. and 10 × 0.8 cm., and are slightly tortuous. Their surfaces are covered with minute translucent cysts, gray in color; the blood vessels are injected; the fimbriae are free. The ovaries measure 4 × 2 × 1.8 cm. and 5.5 × 2.5 × 1 cm. They are attached to the tubes through the broad ligaments, and are slightly firm in consistency. Their surfaces are pitted and ridged, gray-white in color, and not injected. On section the ovarian tissue consists of interlacing white fibers and contains several blood-filled cysts, the largest 0.5 cm. in diameter.

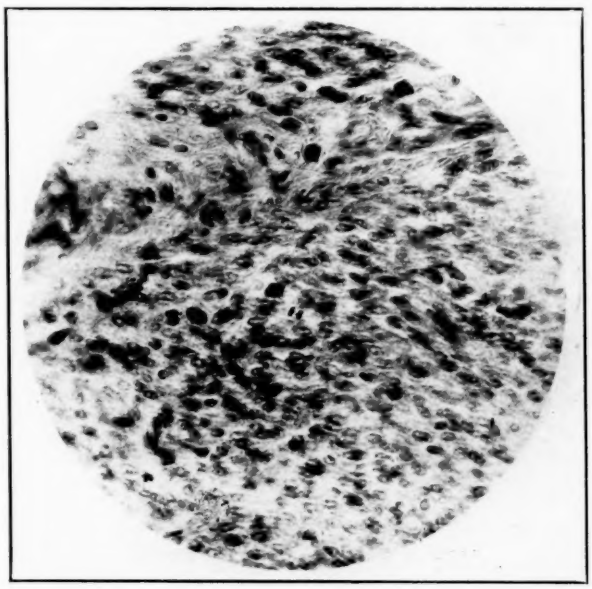


Fig. 3.—Section of tumor from Case 2, magnified 365 diameters. There is moderate variation in the size, shape, and staining-reaction of the cells. Two mitotic figures are seen. This tumor is histologically more malignant than the one shown in Fig. 2.

Microscopic section through the large tumor-mass in the uterus shows rather loosely interwoven bands of smooth-muscle fibers which vary somewhat in size, shape, and staining-reaction, present numerous pyknotic nuclei, and show large areas of degeneration. The tumor is moderately vascular, and occasional mitotic figures are present. The endometrium shows a premenstrual phase, but is otherwise not remarkable. The tubes are not remarkable save for a moderate engorgement

of the walls and serosa. The ovaries contain numerous small cystic cavities; most of these are lined with the remnants of follicular epithelium, but an occasional one is lined with low cuboidal epithelium.

The pathologic diagnosis is cystic oophoritis and leiomyosarcoma of the uterus.

CASE 3.—Miss E. B., thirty-nine years of age, consulted her physician for excessive flowing.

History.—The patient had rheumatic fever at fourteen, which left her with mitral stenosis and regurgitation, chronic myocarditis, and pericardial adhesions. This condition was fairly well compensated. Catamenia began at eighteen years of age; the flow had always been regular and normal until the beginning of the present illness. She was unmarried and nulliparous.

For seven months the periods, still occurring at regular twenty-eight-day intervals, had been increasing in duration and amount. The last two times there had been profuse flowing, with large clots, for eighteen and twenty-one days. As a result she was markedly anemic, with a hemoglobin of 50 per cent and a red blood count of 2,920,000.

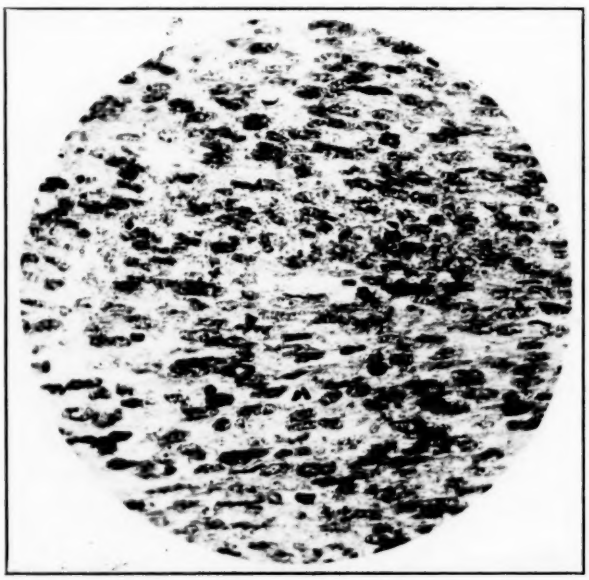


Fig. 4.—Section of tumor from Case 1, magnified 365 diameters. Here there is marked variation in the cellular characteristics. Several atypical mitotic figures are seen. The picture is that of a rapidly growing myoma malignum.

Pelvic examination showed a uterus about twice normal size, nodular, hard, and freely movable. The diagnosis of leiomyoma seemed obvious.

The patient's age, her cardiac condition, and the smallness of the tumor all combined to make the case appear an ideal one for radiation. Accordingly 5 x-ray treatments were given, with most unsatisfactory results. Instead of stopping, the flow became more profuse, and her anemia increased to an alarming extent. After a transfusion of 400 c.c. of blood, operation was undertaken. When the abdomen was opened about 200 c.c. of fresh blood was found free in the peritoneal cavity; this had evidently come from a recently ruptured follicle in the right ovary, which was still bleeding. Supravaginal hysterectomy with right salpingo-oophorectomy was quickly and easily performed.

The postoperative convalescence was complicated by acute tonsillitis and by phlebitis in both legs. Two months later the patient received an x-ray treatment

and an intracervical application of 1200 milligram-hours of radium. A year after operation there was no evidence of local trouble, and her general condition was excellent except for the chronic cardiac disability.

Pathologic Report.—The specimen is uterus, one tube, and one ovary.

The uterus shows in its cavity a rounded pedunculated nodule, pale in color and firm in consistency, 2.5 × 3 × 3 cm. in size. There are also several small tumors in the myometrium. The endometrium is thick and soft. The tube shows no gross abnormality. The ovary is grossly normal; a recently ruptured follicle is seen.

On microscopic examination the endometrium is slightly hyperplastic. The glands are tortuous and irregular. The lining epithelium is hyperplastic and thrown into papillary folds, and shows an occasional tendency to heap up. The supporting stroma is edematous, and densely infiltrated with the products of acute inflammation. The myometrium is edematous, and infiltrated with large numbers of lymphocytes and plasma cells as well as occasional endothelial cells and neutrophils. In the wall there is a circumscribed tumor-mass, composed of closely interwoven smooth muscle-fibers supported by a very small amount of poorly vascular connective tissue. The individual muscle-fibers are hyperplastic, faintly staining, and somewhat irregular in shape. Numerous mitotic figures are present and among them are several diasters.

The pathologic diagnosis is acute endometritis, chronic myometritis, and leiomyosarcoma of the uterus.

Comment.—The endometritis and myometritis probably represent a tissue-reaction to the x-rays. It is remarkable that the bleeding was not controlled by radiation, and also that ovulation could occur, since a full castrating dose was given.

CASE 4.—Mrs. F. C., aged forty-five years, sought medical advice because of excessive flowing.

History.—The past history included considerable sickness, but nothing relevant to the pelvic problem. Menstruation became established at ten years of age, and was regular and normal up to the time when the present illness began. In two marriages, the first dating back twenty-five years, the patient had borne three children, of whom the youngest was thirteen years old.

For about eighteen months the periods, still maintaining a twenty-eight-day regularity, had been profuse and prolonged, lasting ordinarily two full weeks. On the first day of the flow she experienced some pain on urination. Her weight, 186 pounds, had remained constant for years.

Examination showed a uterus irregularly enlarged to about three times the normal size, moderately soft, and freely movable. The preoperative diagnosis was leiomyoma.

At the time of operation the softness of the tumor was again noted. A supracervical hysterectomy with routine appendicectomy was performed.

The patient had a normal postoperative convalescence. After five weeks the cervix was treated with a 1200 milligram-hour dose of radium. Eight months later there was no sign of local trouble, and the general health was good.

Pathologic Report.—The specimen is supracervical uterus and appendix.

The uterus is distorted in shape and enlarged, measuring 10 × 8 × 6 cm. The endometrium is 0.3 cm. in thickness, glistening, and pearl-gray in color; its vessels are markedly injected, and it shows scattered areas of hemorrhage. Section through the uterus shows a large intramuscular tumor-mass measuring 7.5 × 6 cm., consisting of a network of interwoven whitish-gray fibers. The remainder of the muscularis measures 1.8 cm. in thickness, and is not remarkable. The serosa is pink, smooth, and glistening, with vessels moderately injected. There is one firm subserous tumor-mass 1 × 1 cm. The appendix measures 7.3 cm. in length and 0.7 cm. in diameter. Its serosa is smooth, glistening, and pearl-gray in color, with the vessels moderately injected. The lumen contains soft fecal material.

Microscopic section shows that the endometrium is edematous. There are some areas of hemorrhage, and many of the glands are filled with a hemorrhagic exudate. The glands tend to be tortuous and somewhat fern-like, and contain accumulations of lymphocytes. Section of the uterine tumor shows rather loosely arranged bundles of smooth muscle-cells, supported by a relatively large amount of moderately vascular connective tissue. The cells of the muscle-bundles are, in general, hyperplastic; they vary somewhat in their size, shape, and staining-reaction, and present not infrequent mitotic figures. What little reaction is noted throughout the tumor-mass consists essentially of a few scattered lymphocytes and plasma cells. The myometrium is slightly edematous, and contains small scattered accumulations of lymphocytes. The appendix shows a marked increase of connective tissue and fat-cells in the fibro-fatty layer. Numerous lymphatics throughout its wall are occluded with lymphocytes.

The pathologic diagnosis is healed chronic appendicitis, chronic endometritis, chronic myometritis, and leiomyosarcoma of the uterus.

SUMMARY

1. Leiomyosarcoma of the uterus is a fairly common tumor, being found in about 1 per cent of all myomatous uteri examined.

2. While all leiomyosarcomas show some degree of histologic malignancy, only a small proportion of them prove to be clinically malignant.

3. Nevertheless all leiomyosarcomas must be treated as at least potentially malignant, since it is impossible to distinguish a priori between histologic and clinical malignancy.

4. The gross pathology of this tumor is similar to that of leiomyoma, save for minor details often none too well defined. The microscopic pathology is chiefly remarkable for great variation in cellular characteristics.

5. Diagnosis is difficult both before and at operation, though certain gross features suggestive of malignancy have been described.

6. Every myomatous uterus removed should be opened and examined before the operation is completed.

7. The treatment of choice is radical operation, followed by x-rays. When supracervical hysterectomy has been done, the cervix should be treated with radium.

8. Four cases of leiomyosarcoma of the uterus, one of them a true myoma malignum, are reported.

475 COMMONWEALTH AVENUE.

(For discussion, see page 451.)

INTESTINAL OBSTRUCTION IN THE NEWBORN DUE TO MUCOUS PLUG*

By Frederick H. Falls, M.S., M.D., and Richard H. Jaffe, M.D.,
Chicago, Ill.

(From the Departments of Obstetrics and Gynecology and of Pathology, University of Illinois College of Medicine)

INTESTINAL obstruction in the newborn is a comparatively rare condition. When it occurs, it is fraught with all of the ordinary dangers surrounding this condition when it occurs in adults, plus the feeble resistance of the newborn to the shock of operative intervention. The most common etiologic factors are developmental defects in the large or small bowel or, less commonly in the stomach or esophagus. Intussusception or volvulus, involving usually the large bowel, and mechanical obstruction by pressure from without by tumors, may occur. Paralytic ileus or adhesion bands which are so commonly seen in the adults with intestinal obstruction are very rare in the newborn.

During the last three years we have seen 4 babies with intestinal obstruction which was due to a collection of inspissated mucus in the rectum and in one extending upward into the sigmoid colon.

This condition has been called *colica mucosa* by the German pathologists and consists essentially in a complete obstruction of the lower bowel for a varying distance of from 3 to 5 cm. by a plug of tenacious mucus that is closely adherent to the bowel wall. There is no evident narrowing of the bowel wall at this point and no pathologic condition evident in the wall at the point of attachment of the mucous plug, sufficient to be of pathogenic significance.

This type of plugs is not uncommon in newborn babies. They occur, according to our observation, in about 1 per cent of all cases. However, if only those that cause difficulty, such as temporary or permanent obstruction, are considered, not more than one-fifth of 1 per cent are observed and only occasionally does the obstruction persist and produce death. The symptoms are insidious in onset and usually are overlooked by the attendant for from twenty-four to forty-eight hours. The baby takes water normally, sleeps well, and shows no evidence of distress or abnormality. They then begin to show some distention and vomiting; and regurgitation of food of greater or less extent may be noted. The baby may be restless and cry fretfully, but does not seem to have any acute pain. The skin of the abdomen may appear shiny and tense. No fluid wave can be made out and no

*Read at a meeting of the Central Association of Obstetricians and Gynecologists, October 9, 1930.

peristaltic waves are noted. No peritoneal reaction is noted on sudden release of the abdominal wall after pressure. History of obstipation may or may not be obtained. In 2 of our cases the nurse's record showed that the infant had had meconium stools. This was evidently a mistake in observation. There have been no symptoms of absorption of toxins from the bowel, such as fever or significant leucocytosis.

On attempting to give an enema the tube meets obstruction a centimeter or so inside the anal orifice and the water returns clear. In some cases the thermometer cannot be inserted into the rectum for temperature readings. This may be the finding that first calls attention to the condition. Cyanosis was seen in 2 of our cases and in 1 infant that showed rigidity of the abdomen as well as distention and vomiting, a diagnosis of associated peritonitis was made. If the condition is a transient affair, relief of all symptoms follows the passage of a plug of mucus which is usually about two inches long and is greyish colored at the lower end and greenish meconium-stained at the upper end.

The following cases illustrate various clinical types of the condition that we have seen.

CASE 1.—Baby boy R. I. B., was born spontaneously September 28, 1927 at 9:30 A.M. He was premature about one month, weighed 2380 grams, and was in good condition. The baby was apparently normal until Sept. 30 at 4 P.M. at which time he had a blue spell from which he recovered quickly. Two hours later he was found to be cyanotic and in respiratory distress and the abdomen was markedly distended. A tracheal catheter was passed but no accumulation of mucus was found in the trachea. Attempts to relieve the abdominal distention by a colon irrigation was unsuccessful because the tube met obstruction about two inches from the anal orifice and the water returned clear. A diagnosis of acute intestinal obstruction was made (probably volvulus in nature) and operation was decided upon.

A midline suprapubic incision was made under local infiltration anesthesia, one-half per cent novocaine and adrenalin, three drops to the ounce. A large amount of meconium was found in the peritoneal cavity. A rapid exploration of the sigmoid and rectum revealed no volvulus nor was the obstruction plug in the lumen of the rectum, noted. On searching further for the opening from which meconium had escaped, a perforating ulcer about three-fourths of a centimeter in diameter was found in the hepatic flexure of the colon. This was rapidly closed with a fine silk Lembert suture. The abdominal cavity was washed with normal saline solution to remove as much meconium as possible and the peritoneum and fascia were closed with fine catgut. The skin was closed with interrupted linen sutures. One hundred c.c. of normal saline solution was given hypodermically.

The general condition of the baby was poor at the end of the operation which took about thirty minutes. He expired at 1:15 A.M. the next morning.

NECROPSY.—Normally built white baby boy. Weight: 2380 grams; length 42 cm. Abdomen distended. A recent sutured operative wound in the anterior abdominal wall in the midline above the umbilicus 10 cm. long. The abdominal cavity was filled with about 200 c.c. of a thin greenish fluid. The serosa was injected, cloudy, of dirty grayish red color. In the midline of the transverse colon a loop was formed by black silk sutures. Removing these sutures exposed in the anterior

wall of the transverse colon, an irregular opening which measured 11.6 mm. in diameter. The small intestine, and the ascending and transverse colon were markedly distended, while the descending colon, the sigmoid, and the rectum appeared narrow and contracted. The stomach was much dilated by gas and fluid.

Heart, lungs, and liver were negative. Kidneys were swollen and soft. The stomach contained a small amount of a viscid grayish fluid. The mucosa was pale gray and smooth. The small intestine and the upper portion of the colon were filled by a dark green semi-liquid mass. The wall was slightly thickened, and the mucosa was edematous and pale gray in color. In the lower colon the content consisted of a grayish white elastic mass which formed a solid cast and filled the lumen completely. This mass could be easily peeled out and appeared as a cylinder 5 mm. in diameter (Fig. 1). By cutting, small greenish areas were found embedded in a grayish white, slightly translucent substance. The cast terminated in the region of the splenic flexure, at the greenish mass which filled the upper colon, and greenish streaks were seen extending into it. The lower border of the cast was found about 1 cm. above the anus. The mucosa of the lower colon was pale yellowish gray and showed minute yellowish white areas.

Fig. 1.—Descending portion of colon. Magnification 10 times. The lumen is completely filled by a mucous cast which shows a distinct lamination and inclusions of meconium. The mucosa is compressed.

Anatomic Diagnosis.—(1) Mucous colitis with complete occlusion of the descending colon, sigmoid colon, and rectum by mucous cast; (2) perforated stercoral ulcer in the middle of the transverse colon, recently sutured; (3) diffuse peritonitis; (4) fatty degeneration of the liver, with marked erythro- and granulopoiesis; (5) acute congestion of the spleen; (6) congestion and cloudy swelling of the kidneys, and (7) recent laparotomy wound.

HISTOLOGIC REPORT

1. *Colon.*—(a) Ascending portion (Fig. 1): The glands of the mucosa were markedly distended. The distention affected chiefly the central half of the glands. Thus, funnel-shaped structures were the result. The lining epithelium of the glands contained numerous goblet cells and there were glands in which the epithelium was formed only by them. There was a limited number of mitotic figures. The neck and the mouth of the glands were filled with pale stained

shreds. The stroma about the glands showed dilated capillary blood vessels and numerous eosinophile leucocytes. Some of them had a single round nucleus. The content of the intestine consisted of a finely granular mass which stained very pale. Under high power magnification a large number of rod-shaped bacteria could be recognized. Embedded with this mass were clumps of hyalin with eosine pinkish stained scales and ovoid hyaline bodies of a brownish color. There were single free cells with distinct nuclei and some with small and pyknotic nuclei. The muscularis showed no changes. The subserous layer appeared loosened and the surface was covered by an enormous number of rod-shaped bacilli which, in places, also invaded the adjacent parts of the subserosa. There was no reaction to the bacterial invasion.

(b) Transverse portion: The findings were similar to those of the ascending part. The surface of the mucosa was covered with a continuous layer of pale-stained shreds which were connected with the material filling the distended glands. The content of the colon contained here very many of the brownish hyaline bodies which were separated in groups by pale-stained shreds.

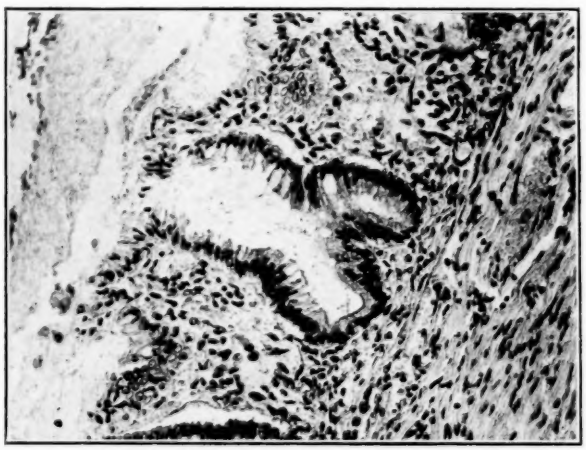


Fig. 2.—Ascending portion of colon. Magnification 350 times. The center of the field shows a gland the neck and mouth of which are much distended and filled with mucus. The epithelial lining consists chiefly of goblet cells.

(c) Descending portion close to the splenic flexure (Fig. 2): The mucosa was compressed and the outlines of the glands were tortuous. The goblet cells were still predominating. The stroma showed very many eosinophile leucocytes which often formed groups. The content showed a distinct separation into three layers. The center was composed of whirls of pale-stained shreds between which were found single groups of hyaline bodies. Then followed a narrow band made up of many cells which were flattened and had pyknotic nuclei. The outermost layer showed very many hyaline acidophilic and brownish bodies.

(d) *Sigmoid:* The dilatation of the lumen was most marked here and the mucosa was compressed to a narrow layer. Eosinophile leucocytes were less numerous. The content showed the same separation as in the descending part.

2. *Liver.*—The liver cells throughout the acini were filled with medium-sized fat droplets. The portal capillaries were dilated and contained numerous islands of round, dark, nucleated cells. These cells had a narrow oxyphilic or polychromatophilic cytoplasm and their nuclei showed a very dense network of chromatin. In some of the cells the chromatin formed a solid clump. The Kupffer cells were very much swollen and they appeared as large basophilic bodies with irregularly-shaped

nuclei. There was some erythrophagocytosis. The periportal connective tissue was very cellular. There were large round cells with a basophilic cytoplasm and round nuclei with a loose chromatin network. Some cells were filled with a coarse oxyphilic granulation, others contained very fine neutrophilic granules. The oxyphilic cells often formed small groups.

3. *Spleen.*—The pulp was very rich in blood. The sinuses were distended and the cords were compressed to narrow bands. The malpighian bodies were uniformly composed of small lymphocytes. In the periphery of the follicles there were many eosinophilic granulated cells with round nuclei and a few small groups of dark nucleated round cells.

4. *Kidney.*—There was a marked dilatation and engorgement with blood of the capillaries of the medulla.

5. *Thymus.*—The thymus was well developed, showing a medullary and cortical part. There were cells with small fat droplets around the larger blood vessels.

The interesting feature of this case was the perforation of the bowel in connection with the intestinal obstruction caused by the mucous plug. The length of the mucous plug was out of all proportion to that of any similar plug seen in other cases or noted by other writers. The sudden onset of serious symptoms with comparatively little preceding evidence of serious trouble with the baby, is noteworthy. The failure of the nurses and interns to observe and record the lack of stools was an important contributory factor to the fatal outcome. Fortunately, we have been put on our guard by this fatal case and the others that we have seen have survived.

I was asked to see a case in consultation with one of my colleagues who had delivered the baby spontaneously, L.O.A., at 11 A.M., July 12, 1929. The girl baby weighing eighty-six ounces was delivered in twelve hours, and her mother who was a healthy primipara twenty-three years old, had had no illness either before or after pregnancy. A meconium stool was recorded by the nurse at birth but the doctor in charge did not remember it. The next day the baby vomited at 6 A.M. and again at 10 P.M. A mucous stool (amount not given) was recorded at 10 P.M. on July 14, 1929. The abdomen was markedly distended and the skin of the abdomen was tense and shiny. A pediatrician was asked to see the baby. He noted the distention of the abdomen and thought he could detect some peristaltic waves. No rectal obstruction was noted on insertion of the catheter; some gas escaped. Enema result was a small amount of white mucus. About three hours later in the day the abdomen was markedly distended, tense, and shiny; the baby was in distress. The baby vomited three times before three o'clock and the vomitus contained bile but no blood. I saw the baby at 3:30 P.M. and inserted a well-oiled thermometer as far as it would go without forcing. I did this very gently on various sides of the bowel. The baby passed a typical mucous plug, about 3 cm. long, at 6 P.M. It had another emesis at 7:30 P.M., another at 8:30 P.M., and again at 11:20 P.M. Following this the baby had a good night's sleep. She vomited once the next morning but also had a good bowel movement containing much mucus. The distention, disappeared and she made an uneventful recovery.

We have seen 3 other cases since the occurrence of the first one noted above, which have given some evidence of intestinal obstruction. On examination they were all found to have obstruction in the lower bowel caused by inspissated mucus. The diagnosis, in each case, was

made early, before the baby had developed any marked distention and before vomiting and cyanosis had developed. Inserting the oiled thermometer resulted in the expulsion of the plug within a few hours in all cases.

This has led to an order to the interns and resident physicians to examine the rectum and test for patency in all infants born in our clinic, and to the nursery nurse to report to the supervisor any child that does not have a good meconium stool within twelve hours after delivery, whether the baby appears sick or not.

DISCUSSION

The etiology of this condition is obscure. Landsteiner[1] found in a fatal case a marked fibrosis of the pancreas which he felt probably altered the secretion of this organ and gave rise to the altered condition of the meconium in the bowel.

A. Fischer,[2] on the other hand, describes a case in which he believed that changes in the liver resulting in abnormal bile formation and extrusion into the bowel lumen resulted in the collection of meconium and inspissated mucus that blocked the bowel.

As to the rupture of the bowel and its pathogenesis there is also no definitely accepted view. Paltauf[3] and Rudneu[4] have come to the conclusion that the perforation occurs through a false diverticulum which occurs at a weak place in the bowel wall produced by a thrombosis of a vessel perforating the muscle coats of the bowel wall.

Zillner[5] reports 4 cases of spontaneous rupture of the sigmoid flexure in newborn infants without associated obstruction or diverticulum formation.

The mode of production of the mucous plug in our fatal case is not clear nor is the pathogenesis of the perforation of the bowel evident. The liver showed no changes comparable with those in the case described by Fischer. Unfortunately, the pancreas was not studied, so we do not know whether or not the findings described by Landsteiner were present.

TREATMENT

Treatment depends on the type of case and on the time at which the diagnosis is made. All babies shoud be inspected carefully and routinely at birth for the presence of obstruction in the lower bowel. Clinical charts should be carefully examined in the first few days of the baby's life to see whether normal meconium stools are being passed. The cases may be divided into two classes. The first includes those with a relatively short mucous plug attached to the wall of the rectum. Minor measures will be sufficient or spontaneous expulsion may be expected in this class of case. If obstruction is present, a well-oiled clinical thermometer should be gently inserted into the rec-

tum and attempts made to loosen the plug from the wall of the bowel by gently insinuating the thermometer between the plug and the bowel wall at several points. This usually results in the baby's expelling the mucous plug within a few hours, followed by complete relief of symptoms.

The second group is that in which an extensive mucous plug is in a part of the bowel not accessible except by operation. In this class of patient a laparotomy should be done as soon as the symptoms of intestinal obstruction become pronounced. The plug of mucus may be high up in the colon or even at the ileocecal valve and lower ileum. Operation should not be delayed until the child is moribund. It is probable that the uniformly fatal results that have followed operations in these cases, would be improved if early intervention were practiced. If operation is undertaken for obscure obstruction, it would seem from the reports thus far submitted that the place most likely to be obstructed is the sigmoid flexure of the large bowel and the next most frequent site is the region of the lower ileum and ileocecal valve.

REFERENCES

(1) *Landsteiner:* Zentralbl. f. Allg. Path. u. Path. Anat. **16:** 903, 1905. (2) *Fischer, A. E.:* Am. J. Dis. Children **36:** 774, 1928. (3) *Paltauf:* Virchow's Arch. **111:** 1888. (4) *Rudneu:* In Aug. Dissert. Basil. (5) *Zillner:* Virchow's Arch. **96:** 1884.

Lee: Weights and Measurements of the Chinese Newborn. National Med. J. China **16:** 707, 1930.

The average weight of the Chinese newborn, irrespective of sex, is 3052 grams. Male infants tend to weigh more than female infants, the average weights being respectively 3,124 grams and 2,980 grams. Children born of Southern parents tend to weigh more than those born in Central China and babies born in the North are still less heavy. The birth weight increases directly with the parity of the mother up to the birth of the 4th child and thereafter is somewhat diminished. It is also found that the size of the infant tends to increase with the age of the mother at the time of birth. The diameters of the full term Chinese fetal skull are somewhat smaller than in the case of full term American infants.

C. O. MALAND.

ACUTE LYMPHATIC LEUCEMIA COMPLICATING PREGNANCY*

By Bernard Mann, M.D., F.A.C.S., Philadelphia, Pa.

ACUTE lymphatic leucemia is a very rare complication of pregnancy. Wm. Allen reporting a case recently states that less than six cases have so far been reported.

M. S., white, twenty-three years of age, was admitted to the Northern Liberties Hospital, September 22, 1928, in labor. Fever, marked weakness, pain and edema of the lower extremities, cough, bloody expectoration, and headache. Her membranes had ruptured two hours prior to admission.

Menstrual history was normal. The last period occurred on February 6, 1928. She had three children, the last one eleven months old. She had influenza eight years ago and again nine months ago. During this pregnancy, she suffered from headache, vertigo, black spots before the eyes, edema of the legs, frequency of urination, night sweats, and some loss of weight.

The physical examination revealed an undernourished young female, flushed face, apparently in fever and in labor. The teeth were in very bad condition. Heart sounds were rapid and weak, but clear. Blood pressure was 100 over 60. Lungs were clear. Lower extremities were somewhat edematous. There was no evidence of glandular enlargement. The abdomen was enlarged and the uterus was the size of about a seven months' pregnancy. Uterine contractions were noted. Fetal heart sounds could not be heard. The spleen could not be felt.

On pelvic examination the cervix was found dilated about three fingers, the vertex presenting and the membranes ruptured. There was a moderate amount of brownish discharge which was very offensive.

She delivered herself of a living, male baby, weighing five pounds, seven hours after admission.

The acute symptoms began eight days before admission; manifested by fever reaching 104°, weakness, pains in the lower extremities, and headache. Her physician diagnosed the condition as influenza. On admission to the hospital, her temperature was 102°, pulse 120, and respirations 22. Two hours after her delivery she got out of bed, was irrational, and was with difficulty, restrained and kept in bed. She then had a severe postpartum hemorrhage. Pulse 140, temperature 104°. Eight hundred c.c. of normal saline was given intravenously. Pituitrin and ergot controlled the bleeding.

The uranalysis showed a heavy trace of albumin; no sugar; few granular and hyaline casts, many W. B. C. and R. B. C. Blood examination: R. B. C., 3,000,100; W. B. C., 4,800; hemoglobin, 55 per cent; polynuclears, 21 per cent; small lymphocytes, 79 per cent.

At this time it was thought that the nature of the infection might be pneumonia. This was suggested by the bloody expectoration and the moderately high fever which tended to be continuous, but the absolute absence of pathology in both lungs on physical examination and negative x-ray findings of the chest ruled it out. For the same reason pulmonary tuberculosis was eliminated, although she had bloody expectoration, loss of weight, and night sweats.

The marked leucopenia helped to uphold a diagnosis of influenza or typhoid fever, although the percentage of lymphocytes was unusually high.

*Reported before the Philadelphia Obstetrical Society, February 7, 1929.

On September 24, 1928, the blood picture changed considerably. Hemoglobin, 40 per cent; large lymphocytes, 50 per cent. She was given 450 c.c. of blood by transfusion, which did not improve her condition. She continued in a toxic state, elevated temperature, and pulse, dry tongue, etc. Many ecchymotic spots were noted on her chest, upper extremities and mouth, varying in size from a pinhead to the size of a silver quarter.

This finding together with the high percentage of lymphocytes suggested a diagnosis of acute lymphatic leucemia in spite of the absence of any glandular enlargement.

This diagnosis also explained the symptoms of hemorrhage from the lungs and into the skin, the fever and probably the uterine hemorrhage.

The blood culture and Widal were negative. Blood Wassermann was 2-plus. A blood count showed hemoglobin, 35 per cent; R. B. C., 1,730,000; W. B. C., 17,800; Poly 3 per cent; small lymphocytes, 6 per cent; large lymphocytes, 91 per cent.

She was again transfused, 400 c.c. of blood being given.

The temperature remained high, reaching almost 105°, the pulse rate continued 150 and over. She developed a diarrhea which continued until her death. Toward evening she became restless and delirious, and had a severe chill which lasted for five minutes, and she died at 11:25 A.M., Sept. 27, 1928.

REPORT OF AUTOPSY

Female about twenty-three years old. Development of skeleton was normal. General nutrition poor. The skin presented scattered early ecchymotic spots varying in size from a pinhead to a silver quarter in diameter. Similar discoloration is observed on the mucous membrane of the mouth. The superficial lymph glands are not enlarged.

The abdominal cavity was free from fluid or gas, but the peritoneum, both parietal and visceral, was studded with minute hemorrhagic spots. The mesenteric lymph nodes were not enlarged. There was no evidence of inflammation or ulceration along the gastrointestinal tract, except the minute hemorrhagic spots which could be seen through the peritoneal covering. The liver was much larger than normal, weighing 1970 gm. (normal 1600 gm.). It was rather pale, its surface was smooth, its capsule not thickened or adherent. A few hemorrhagic spots were seen through the capsule.

The spleen was nearly twice as large as normal, weighing 370 gm. (normal 200 gm.). It was dark in color, smooth surface, its capsule was not thickened or adherent. The trabeculae were less numerous than in the normal spleen. There was hardly any differentiation between splenic pulp and nodule, the latter was evidenced in many instances only by the splenic artery around which collected a few deeply staining lymphocytes. The entire specimen was filled with small lymphocytes in a diffuse and disorderly arrangement. Red blood cells were seen scattered among the lymphocytes. Here and there minute areas of necrosis were seen. The main feature of the specimen was the overflowing of the lymphocytes from the nodules into the pulp, obliterating thereby the normal histology of the spleen.

Both kidneys were slightly enlarged, weighing 200 gm. each. The capsule could be stripped off easily. Minute ecchymotic spots were seen through the capsule and also in the kidney substance on cross-section. The specimen presented evidence of cloudy swelling, the cells lining the tubules being large and granular. Occasional collections of small lymphocytes were present. Microscopic hemorrhages were seen.

The pancreas was about normal in size, shape, and appearance.

The pleural cavities were free from gas, fluid, or adhesions.

The pericardium presented many ecchymotic spots and contained about 6 c.c. of straw-colored fluid.

The heart was normal in size, weighing 250 gm., its chambers containing a grayish clot. The valves were free from lesions. Specimen presented a rather marked infiltration with lymphocytes, the latter were not present in large collections, but rather in small groups between the muscle fibers, in many instances the lymphocytes were seen between the muscle fibers in single files.

The uterus was about the size of a grapefruit, soft, and boggy. The specimen presented areas of necrosis and was rather densely infiltrated with small lymphocytes.

The lungs presented no evidence of pneumonia or tuberculosis.

The mediastinal glands were not enlarged.

The brain, spinal cord, and bones were not examined because of restrictions accompanying the permission for autopsy.

The presence of small hemorrhages over the peritoneum, pericardium, the kidneys, the large spleen and liver, together with the microscopic findings and the blood picture, were conclusive evidences that this is a case of acute lymphatic leucemia.

1309 Spruce Street.

JOHN STEARNS AND PULVIS PARTURIENS

By Herbert Thoms, M.D., F.A.C.S., New Haven, Conn.

THE story of ergot is a dramatic chapter in medical history. This fungous growth has the distinction of being in the past the cause of one of the greatest scourges mankind has known, and at the present time a therapeutic agent of life-saving importance.

Ergot (Claviceps purpurea) is a fungous growth obtained almost exclusively from the cereal grain rye. The word is derived from the French "argot," "the spur of a cock," which the growing fundus somewhat resembles. It has probably been known from earliest times. We learn that an Assyrian tablet about 600 B.C. alludes to a "noxious pustule in the ear of grain," and in one of the sacred books of the Parsees (400-300 B.C.) there occurs this passage: "Among the evil things created by Angro Maynes are noxious grasses that cause pregnant women to drop the womb and die in childbed.

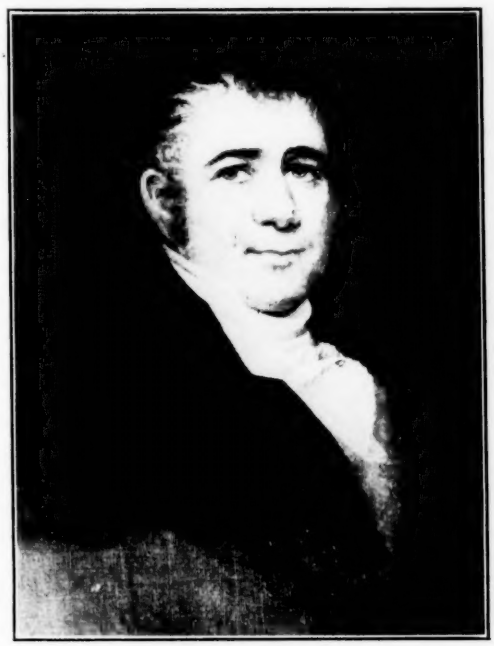
It was not until the close of the seventeenth century that ergot became recognized as the cause of a pestilential disease which had ravaged the human race for centuries. Ergotism was variously known as St. Anthony's Fire, Ignis Sacer, and Ignis Inferius, and was due to the ingestion of ergotized grain.

The history of ergot as a therapeutic agent is in its beginnings somewhat obscure. Wellcome[1] tells us that Camerarius in 1688 writes of its use in certain parts of Germany to accelerate parturition. In 1774, M. Parmentier mentions in a letter that powdered ergot is used in slow labor, and in 1777, a surgeon of Lyons, Desgranges, published observations concerning the use of spurred rye in lingering labor.

Medical historians, however, are quite agreed that the chief credit for the introduction of ergot in scientific obstetrics is due to Dr. John

Stearns, an American physician born in Wilbraham, Massachusetts, May 16, 1770, and who died in New York City, March 18, 1848. A brief story of the discovery and the discoverer should have interest to American obstetricians because the former definitely belongs to American obstetrics and the latter was one of the great influences, particularly in New York State, for the betterment of American medical practice.

Of the boyhood of John Stearns, but little is known. He graduated from Yale College with distinguished honor in 1789, and began his preparation for medical practice with Dr. Erastus Sergeant, of Stockbridge, Massachusetts. Dr. Sergeant was one of the leading men of



JOHN STEARNS

his time. He had had a distinguished career in the Revolution as an Army surgeon, and was one of the eminent operators of his day. After two years, Stearns went to Philadelphia, where he attended the lectures of Shippen, Wistar and Rush. It will be noted that both in liberal arts and medicine this young doctor received probably as fine educational facilities as the country then afforded. In 1793, Stearns began to practice medicine near Waterford, in the county of Saratoga, New York. The influence of his ability and education must soon have been felt, for in 1805, when the Medical Society of the State of New York was founded, we are told by Williard[2] that the leading spirit in the enterprise was Dr. John Stearns, of Saratoga County. He was elected secretary at this first meeting, and continued in this important office for many years. It was in 1807 that the first of his notable con-

tributions on ergot appeared.[3] In a letter dated at Waterford, January 25, to Dr. S. Ackerly, he wrote the following:

"In compliance with your request I herewith transmit you a sample of the pulvis parturiens, which I have been in the habit of using for several years, with the most complete success. It expedites lingering parturition, and saves to the accoucheur a considerable portion of time, without producing any bad effects on the patient. The cases in which I have generally found this powder to be useful, are when the pains are lingering, have wholly subsided, or are in any way incompetent to exclude the fetus. Previous to its exhibition it is of the utmost consequence to ascertain the presentation, and whether any preternatural obstruction prevents delivery; as the violent and almost incessant action which it induces in the uterus precludes the possibility of turning. The pains induced by it are peculiarly forcing; though not accompanied with that distress and agony, of which the patients frequently complain when the action is much less. My method of administering it is either in decoction or powder. Boil half a drachm of the powder in half a pint of water, and give one-third every twenty minutes until the pains commence. In powder I give from five to ten grains; some patients require larger doses, though I have generally found these sufficient.

"If the dose is large it will produce nausea and vomiting. In most cases you will be surprised with the suddenness of its operation; it is, therefore, necessary to be completely ready before you give the medicine, as the urgency of the pains will allow you but a short time afterward. Since I have adopted the use of this powder I have seldom found a case that detained me more than three hours. Other physicians who have administered it concur with me in the success of its operation.

"The modus operandi I feel incompetent to explain. At the same time that it augments the action of the uterus, it appears to relax the rigidity of the contracted muscular fibers. May it not produce the beneficial effects of bleeding without inducing that extreme debility, which is always consequent upon copious depletion? This appears to be corroborated by its nauseating effects on the stomach, and the known sympathy between this viscus and the uterus.

"It is a vegetable, and appears to be a spurious growth of rye. On examining a granary where rye is stored, you will be able to procure a sufficient quantity from among that grain. Rye which grows in low, wet ground, yields it in greatest abundance. I have no objections to your giving this any publicity you may think proper."

Accordingly, in 1807, in the eleventh volume of *The New York Repository* the "proper publicity" was given. Like most great innovations in medicine, the start was inconspicuous, and it was not until several years had passed that the importance of the discovery awakened a controversial response of ardent and vehement character. This was due in large measure to certain poor results, which accompanied the administration of the drug indiscriminately in labor. In passing, it is interesting to observe that we have been through in recent years an identical experience with pituitrin, and it appears that this therapeutic agent also must go through a considerable time cycle before knowledge of its proper administration becomes universal.

A noteworthy champion in the cause of ergot is found in Oliver Prescott,[4] of Massachusetts, who gave a scholarly dissertation on the subject before the Massachusetts Medical Society on June 2, 1813. He alludes particularly to the frequency of fetal death associated

with the improper administration of ergot, and points out the great value of this drug in uterine hemorrhage.

He writes: "It is also too active and powerful an agent, to be safely directed by an ignorant or unexperienced accoucheur; and before dismissing the subject, I most cordially join in cautioning those, who have not been in the practice of using it, and witnessing its operations, to be wary how they employ its agency, until the muscular fiber is properly relaxed, and the *os uteri* considerably dilated. This caution is also more especially necessary, if they are not positively certain that the presentation is natural, as well as 'that there are no preternatural obstructions to prevent delivery; as the violent pain, and almost incessant action, which it frequently induces, in the uterus, precludes the possibility of turning' the fetus.

"The tendency of its operation is, I conceive, to constringe the uterine fibers, and lessen the caliber of its blood vessels; for when given to parturient patients, there has been no instance, within my knowledge, of undue hemorrhage after delivery, although several, who have taken it, have been previously accustomed to profuse discharges. The lochia also, have occasionally been so much diminished, after its use, as to excite apprehension for the event. In two cases, this discharge entirely ceased, on the second or third day after delivery, and did not reappear during the month; but no puerperal complaint was induced, nor was their recovery delayed by this incident.

"The uniform operation of the ergot to restrain uterine hemorrhage, has been noticed by other physicians. It has in consequence, frequently been prescribed, a little previous to the birth of the child, or immediately after, to patients who have been accustomed to flow immoderately, at such times, and it has always proved an effectual preventive."

Many of Stearns's contemporaries, however, were not of so favorable an opinion. We find that the versatile pharmacopeist, Lyman Spalding[5] was disappointed both in the efficacy of the drug and in his ambition to become a great obstetrician. In a letter to William Hammersley, he suggested that "a dozen doses of ergot and an equal number of papers containing the same quantity of ground coffee" be prepared. These were to be given at random by the nurse in a certain number of cases, and after explicit directions for carrying out this unique experiment, the author concludes, "When his" (i.e., the doctor's) "twenty-four powders are all used let him read his remarks on his twenty-four cases and if he have not recorded as wonderful effects from the use of twenty grains of coffee when the os tincae was dilated to the size of a dollar as from the use of a like quantity of ergot, certainly the article was not genuine or it has failed to produce its usual effects when administered by your most obedient and humble servant. L. Spalding."

In 1882, however, the advantages of ergot in obstetrics were firmly established in a masterly essay by the discoverer, John Stearns.[6] This was "Observations on the Secale Cornutum, or Ergot, with directions for its use in Parturition." Owing to lack of space, it is not possible to reproduce in toto this epoch-making contribution. A few

extracts may serve, however, to whet the appetite of the reader to peruse the entire essay. I can assure him that he will be amply repaid for his effort.

"It was not till the year 1807," writes Stearns, "that the ergot ever appeared before the public in a form to arrest the attention of medical men. Some years previous to this, I was informed of the powerful effects produced by this article, in the hands of some ignorant Scotch woman, in the county of Washington. Determined to try its efficacy, I procured a quantity from a field of rye. My information was such as to impress upon my mind the necessity of extreme caution in my first experiments. The continued influence of this impression upon my subsequent practice, has been a source of much consoling reflection. It has tended to prevent those fatal errors which have so often occurred, and which, I trust, will be satisfactorily explained in the ensuing remarks. . . .

"The publication of my letter to Dr. Aekerly, in 1807, produced an immense number of applications from remote practitioners. I immediately forwarded to each samples of the ergot, with directions for its use. . . . The success of the ergot is in no case more evident than in the selection of a suitable time of its exhibition. Although often given to procure abortion, it does not appear to have succeeded. It also generally fails to complete success when given in the early stages of labour, and before the os uteri is sufficiently dilated and relaxed. . . . I will now proceed to consider those indications which render its exhibition necessary and important.

"The ergot is indicated, and may be administered,

"I. When, in lingering labours, the child has descended into the pelvis, the parts dilated and relaxed, the pains having ceased, or being too ineffectual to advance the labour, there is danger to be apprehended from delay, by exhaustion of strength and vital energy from haemorrhage or other alarming symptoms.

"II. When the pains are transferred from the uterus to other parts of the body, or to the whole muscular system, producing general puerperal convulsion.

"III. When in the early stages of pregnancy, abortion becomes inevitable, accompanied with profuse haemorrhage and feeble uterine contractions.

"IV. When the placenta is retained from a deficiency of contraction.

"V. In patients liable to haemorrhage immediately after delivery. In such cases the ergot may be given as a preventive, a few minutes before the termination of the labour.

"VI. When haemorrhage or lochial discharges are too profuse immediately after delivery, and the uterus continues dilated and relaxed without any ability to contract.

"I have thus exhibited a general view of the errors often committed in prescribing ergot, of the unfavourable results of such practice, of those cases in which it never ought to be administered, and of the indications which render its exhibition necessary and important. These remarks are derived from actual experience in several hundred cases, and are confirmed by those whose observations have been the most extensive and correct. While there is reason to suspect the influence of prejudice upon the minds of some who oppose its use, their own statements generally admit their very limited opportunities for witnessing its effects, and in some instances, while using it in their first experiments, on which their opinons were founded, that they grossly deviated from every direction calculated to ensure success.

"While the frequent occurrence of such abuses is to be deplored, much satisfaction may be derived from this reflection, that a prudent and judicious use of this article has in a great variety of instances contributed to save the lives of the mother and child. That such will continue to be its effects when directed by a dis-

creet, judicious, and experienced practitioner, we have the most satisfactory reason to infer from past experience, and from the peculiar properties and operation of the ergot.''

A perusal of the life of Dr. John Stearns, the discoverer of ergot, reveals at once that he was a man from whom great things could be expected. With his fundamental culture, he developed his talents to such a degree that his life is marked with noteworthy achievement. Only the briefest survey of the life of John Stearns is possible, yet such a survey shows at once his caliber.

His extraordinary ability as secretary of the Medical Society attracted attention, and in 1809 he was elected a senator in the State of New York, serving four years. In 1812, the regents of the University conferred upon him the honorary degree of M.D. In 1817, he was elected President of the State Medical Society, and was subsequently reelected for three succeeding terms. In 1810, he removed to Albany, and nine years later to New York City, where the remainder of his life was spent. In the latter place, he became prominent as a consultant, and contributed largely to the medical periodicals of that day. When the New York Academy of Medicine was organized in 1846, the honor of being the first president fell to Dr. Stearns, then seventy-five years of age. Four years later, he died of septicemia from a dissection wound received while performing an autopsy. That the value of Stearns's discovery was known and appreciated by his contemporaries is well shown by the testimony of Dr. William Tully,[7] one-time Professor of Materia Medica in the Yale Medical School, who wrote: ''As it was reserved however for the illustrious Jenner to investigate and promulgate to the world the important discovery of vaccination, so it has fallen to the lot of our countryman Dr. Stearns, first to search into and ascertain by experiment; to reduce to scientific form and make public the powers of the Clavus, and at the same time, to prescribe the true restrictions, and limitations which should always regulate its use.''

REFERENCES

(1) *Wellcome, H. S.:* From Ergot to Ernutin. Lecture Memoranda, A. M. A., Chicago, 1908. (2) *Williard, S. D.:* Annals Med. Soc., County of Albany, 1806-51 (quoted by Walsh, J. J.). (3) *Stearns, J.:* N. Y. Med. Repository **11:** 1807. (4) *Prescott, O.:* Dissertation on Ergot. Annual Meeting Mass. Med. Soc., June 2, 1813, Boston, Publ. by the Society. (5) *Spalding, L.:* U. S. J. Med. Surg. **8:** 145. (6) *Stearns, J.:* Med. Rec. **5:** 666, 1822. (7) *Tully, Wm.:* Am. J. Sc. & Arts **2:** 45, 1820.

REFERENCES ON THE LIFE OF STEARNS

(8) Transactions of A. M. A. **3:** 1850. (9) *Walsh, J. J.:* N. Y. State J. Med. **8:** 197-377, 1908. (10) *Kelly and Burrage:* American Medical Biographies, Baltimore, p. 1091, 1920.

NEW HAVEN HOSPITAL.

PRIMARY CARCINOMA OF THE FALLOPIAN TUBE, WITH A REPORT OF TWO CASES*

By Brooke M. Anspach, M.D., and Jacob Hoffman, M.D.,
Philadelphia, Pa.

(From the Department of Gynecology, Jefferson Medical College Hospital)

PRIMARY carcinoma of the fallopian tubes is listed by Stübler and Brandes as forming 0.45 per cent of all genital cancers. An approximate idea of its incidence is shown by the fact that it occurred once in 19,439 gynecologic cases at the University Hospital in Philadelphia; five times in 35,000 cases at the Johns Hopkins Hospital, Baltimore; three times in 30,000 at the Bellevue Hospital, New York; and once in 4,275 cases admitted to the gynecologic service of the Jefferson Hospital since 1922.

Notwithstanding its rarity one is interested to note that within the experience of a group of men primary carcinoma of the tube may be relatively frequent. For example, Wharton and Krock, reported a series of 14 cases, of which five occurred at the Johns Hopkins Hospital, the remainder at neighboring hospitals, and one of us has had two cases, during the last three years. In November, 1929, Wharton and Krock estimated that 230 cases had been recorded up to that time. Since then, additional cases have been reported by P. Y. Kolartchouk (two cases); R. E. Watkins and W. M. Wilson (one case); and P. Klein (one case, associated with tuberculosis of the tube); to these we wish to add two, bringing the total up to 236. We shall not discuss the etiology, pathology, symptomatology or treatment of primary carcinoma of the tube, except to point out that in both of our cases an intermittent bloody serous discharge was the outstanding feature. In a woman past the menopause this is a significant symptom. Wechsler's summary of 53 postclimacteric cases in 1926 shows that a bloody discharge was present in more than half of those beyond the reproductive period.

The diagnosis of the disease in the early stage is difficult to make, but a careful observation of the patient and the exclusion of other sources of hemorrhage will be of much value. Those interested in the subject are referred to the many excellent papers that have been written, especially those of Wechsler and of Wharton and Krock.

The purpose of the present communication is to place two cases on record.

*Read before the Obstetrical Society of Philadelphia, January 9, 1931.

Case 1.—E. W., aged sixty-four, consulted us in September, 1928, stating that, after a five-day motor trip she had experienced slight pain in the right lower abdomen, which was followed and relieved by a watery and bloody leucorrhea. The patient had married at the age of forty-three; there had been two labors, and one abortion at six weeks. The menstrual periods were regular until the menopause at fifty-two. The patient's general health was excellent, her weight varying between 150 and 160 pounds.

Pelvic examination showed a marked relaxation of the vaginal outlet; a little pinkish discharge was observed in the vagina. The uterus was small and slightly in descensus. The abdomen was fat and definite palpation of the adnexa difficult. No blood was seen in the cervix, even after vigorous palpation.

The patient was examined at frequent intervals but it was not until more than two weeks after the initial visit that blood was detected coming from the cervical canal.

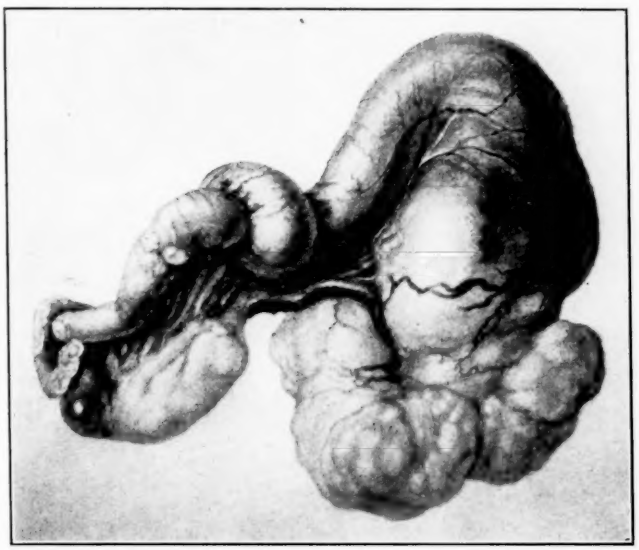


Fig. 1.—Primary Carcinoma of the right tube. Small atrophic ovary not involved. Pelvic examination: Tubal enlargement on the right side, suspected but not positive. Exploratory section. (From Anspach's *Gynecology*, J. B. Lippincott Co., Philadelphia.)

The patient was much opposed to any operative procedure, but after urging, she consented to a diagnostic dilatation and curettage. This was performed on October 5, 1928. The endometrium was quite atrophic; pelvic examination under anesthesia discovered no enlargement of the uterus or adnexa; periodic discharge of bloody fluid from the uterus recurred within the month. A second curettage and the removal of a few small polyps from the cervical mucosa was done January 11, 1929; the periodic discharge continued.

About six weeks later, there developed an ill-defined enlargement of the right tube and ovary. When exploratory section was suggested, the patient recalled that as a young unmarried woman a diagnosis of right adnexal enlargement had been made and an operation for the removal of the pelvic organs had been suggested. Later, after her marriage at the age of forty-three, on the basis of the same findings, she was told that it would be impossible for her to conceive. Despite this opinion, she conceived almost immediately. She had acquired, as a result of these experiences a skeptical attitude toward surgical intervention. This was overcome later, April 19, 1929, when repeated pelvic examinations had disclosed a

definite progressive enlargement of the right adnexa and a small nodule on the anterior surface of the uterus.

On opening the abdomen, examination of the pelvic viscera disclosed a carcinomatous growth involving the right tube and ovary. Metastatic nodules were found in the pouch of Douglas, beneath the right vesicocervical reflection of the peritoneum and in the wall of the sigmoid at the pelvic brim.

The operation consisted of a supravaginal hysterectomy, bilateral salpingo-oophorectomy, and partial excision of the metastatic nodules. Deep x-ray treatments were given after the wound had healed. The patient died seven months after the operation.

Pathologic Report.—Gross: The specimen consists of the uterus and right adnexa. The uterus is small and atrophic; the tube and ovary although senile are normal throughout.

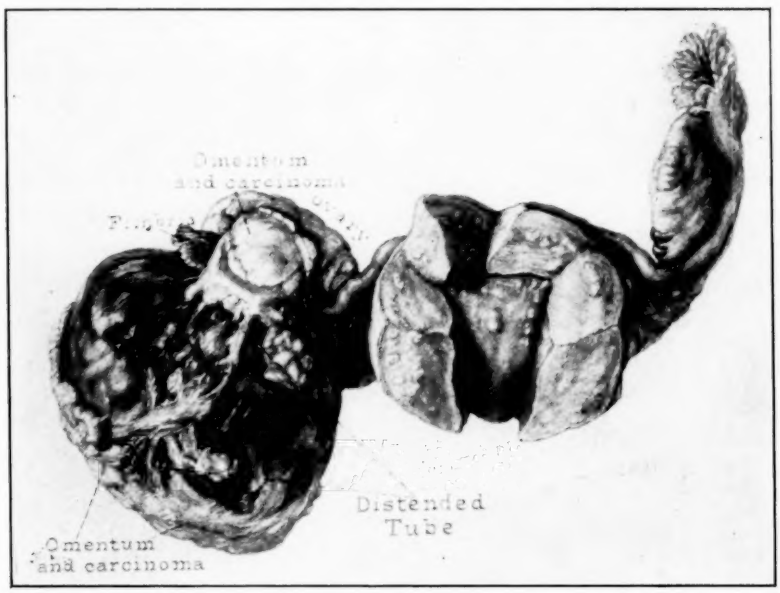


Fig. 2.—Primary Cancer of the right tube. Possibly became hopeless during course of observation. Pelvic examination: at first negative; stout woman. At operation extension to omentum and to sigmoid, enlarged glands in the mesentery of the sigmoid. (From Anspach's *Gynecology*, J. B. Lippincott Co., Philadelphia.)

The right tube up to its middle third (a distance of 2½ cm.) appears normal. It then becomes markedly thickened and forms a firm, irregular, sausage-shaped enlargement measuring 6¼ × 3½ cm. The fimbria are seen at the outer extremity in close approximation to the ovary. There are many nodular omental adhesions. Here and there small papillary, nodular excrescences are seen. A firm, grayish-yellow nodule partly covered by omentum, measuring 2 cm. in diameter, is seen upon the superior aspect of the tumor and closely adherent to the ovary.

The ovary is closely attached to, and forms a part of the adnexal mass which measures 6¼ × 5 × 3½ cm. but the ovary itself is not increased in size. The color of the tumor varies from a purplish-red to a grayish-yellow. The uninvolved part of the tube forms a pedicle uniting the tubal mass to the uterus.

Microscopic: Tube: Section through the tube wall, including the tumor mass, reveals an advanced carcinomatous growth which involves almost the entire mucosa and has a distinct tendency to grow lumen-wards. Only a few well-preserved tubal

plicae are seen. Many papillary masses, consisting of a slim degenerated core, and covered with layers of epithelium of the cylindrical variety, extend into the lumen of the tube. The fusion of these papillae results in the formation of alveolar-like structures. Numerous solid islands of carcinoma cells exhibiting a variation in their size and shape, are present. Mitosis, polynucleosis and hyperchromatosis are noted. Very little of the normal stroma remains, most of it being replaced by large necrotic areas surrounded by dense polymorphonuclear and round cell infiltration. In one area, the epithelial cells are seen breaking through the basement membrane and beginning to infiltrate the muscularis. Most of the muscular coat seems to have escaped this carcinomatous process.

Right Ovary: The ovarian stroma is infiltrated by an alveolar growth, resembling that of the tube.

Peritoneum: Shows the same picture as the growth found in the tube and ovary.

Diagnosis: Primary papillary alveolar carcinoma of the right fallopian tube, with metastases to the right ovary and the peritoneum.

CASE 2.—Miss A. F., single, aged seventy-three, was first observed October 28, 1929. She complained of a bloody leucorrhea. At its beginning, three months before, the vaginal discharge had been white; later it had become yellow and finally, three weeks before, bloody.

Menstruation had been regular until the approach of the menopause, twenty-six years before, at the age of forty-seven when for a while there had been some menorrhagia. Her general health was good, except for hypertension. Her weight had not changed within the last five years.

Pelvic examination revealed a senile vaginitis; there was a small amount of a serosanguineous discharge in the vaginal vault. No blood, however, was seen coming from the cervix. The uterus was atrophic, and in normal position. The abdomen was fat and the adnexa at that time were not palpable.

Diagnostic curettage, October 29, 1929, disclosed a small uterine cavity. The endometrium was atrophic; malignant disease of the uterus was excluded.

The blood-tinged, watery discharge continued despite relief of the vaginitis with local therapeutic measures. The patient was kept under close observation. Pelvic examination at a later date following a vigorous palpation of the uterus disclosed dark blood coming from the external os. An enlargement of the right tube and ovary was suspected.

On February 1, 1930, a laparotomy was performed. Examination of the pelvic viscera revealed a nodule about the size of an English walnut in the outer third of the right tube. The outer half of the tube was distended with a bloody fluid. The ovary was entirely uninvolved. A right salpingo-oophorectomy was performed. Spinal anesthesia failed; the patient was difficult to relax with gas and ether; there was some difficulty in exposing the pelvic organs. The patient died one week later from adynamic ileus.

Pathologic Report.—Gross: The specimen consists of a right fallopian tube and ovary.

The tube is retort shaped, measures 7½ cm. in length, and contains a newgrowth occupying its outer third and projecting from its abdominal ostium; its middle and inner parts are covered with a purplish-red serosa. The thickness of the tube varies from 0.4 cm. at the uterine cornu to 3.5 cm. at the pars-abdominalis. The outer part of the tube is cystic, the inner half is tortuous in appearance and at the middle third is twisted upon itself resembling a knot. The tube rapidly increases in thickness and about the junction of the middle and outer third fuses with a nodular, lobulated, grayish-yellow mass measuring 6 × 4 × 3 cm. The fimbriated end is continuous with this cauliflower-like mass covered with fine papillary excresences; over the surface there is a network of small blood vessels.

The right ovary is senile, and measures 2 × 1 × ½ cm. An old corpus albicans is seen at the outer pole. The ovary has absolutely no connection with the nodular mass found at the outer end of the tube.

Microscopic: Tube: Examination of sections from a piece of tissue removed from the nodular surface of the growth reveals that it is composed for the most part of epithelial elements with very little surrounding stroma. There are numerous plump papillary formations, made up of a fibrous core and covered with many layers of epithelium. The outer layers of these papillae show evidence of degeneration. Here and there, long, slender strands of cylindrical epithelium present an elaborate arborescent effect. Solid masses of epithelial cells of the cylindrical variety are seen. The nuclei of the cells are deeply stained and many are undergoing mitosis. In a number of places, small alveolar formations are noted. Extensive areas of degeneration and necrosis appear, especially near the lumen. The muscular coat, although markedly attenuated, presents but slight involvement.

Diagnosis: Primary papillary alveolar carcinoma of fallopian tube.

REFERENCES

(1) *Anspach, Brooke M.:* Am. J. Obst. & Gynec. **20:** 571, 1930. (2) *Klein, P.:* Zentralbl. f. Gynäk. **53:** 1810, 1929. (3) *Kolartchouk, P. Z.:* Vapr. onkol, Kharkoff. **2:** 222, 1929. (4) *Liang, Zue:* Arch. f. Path. Anat. **259:** 577, 1926. (5) *Orthmann:* Ztschr. f. Geburtsh. u. Gynäk. **15:** 212, 1888. (6) *Sänger, M., und Barth, J.:* Die Neubildungen der Eileiter; Handbuch der Krankheiten der Weiblichen Adnexorgane, von A. Martin, p. 240-299, 1895. (7) *Watkins, R. E., and Wilson, W. M.:* Surg. Gynec. & Obst. **51:** 125, 1930. (8) *Wechsler, H. F.:* Arch. Path. & Lab. Med. **2:** 161, 1926. (9) *Wharton, L. R., and Krock, F. H.:* Arch. Surg. **19:** 848, 1929.

1827 Spruce Street.

A CERVICAL DILATOR

By L. H. McCalla, M.D., Greenville, S. C.

THIS photograph shows a cervical and uterine dilator which I have found practical in my hands.

The instrument is made from a handle of a long curette. One end was threaded

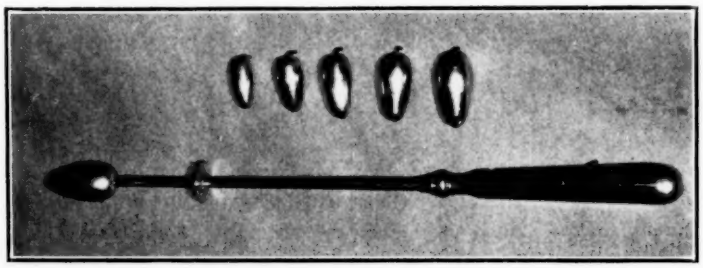


Fig. 1.

so as to fit different size olivary tips and the flarge placed 2½ inches from this end which is a protection from pushing the dilator too far into uterine canal. The total length of the instrument is 10½ inches, it is light and easily handled and if two handles are available the nurse can change to the next size olivary tip while the smaller size tip is in use by the operator, thus avoiding any delay.

INIENCEPHALUS, WITH THE REPORT OF A CASE*

By Joseph Bear, M.D., Richmond, Va.
(Assistant Professor of Obstetrics, Medical College of Virginia)

FETAL monstrosities are always a source of scientific curiosity and in a certain percentage of cases may bring about varying degrees of dystocia and prolonged labor and are frequently associated with hydramnios. Iniencephalus, or fetus retroflexus, is a very rare condition, being first described by Saint-Hilaire in 1836. Ballyntine had seen only 7 cases in 1904; he found they were usually born dead and

Fig. 1.—Lateral view.

premature; the majority were females. Dorland, of Chicago, in 1925 fully reviewed the literature and, with the report of an additional case of his own, gave a total of 38 cases. Since that time 2 other cases have been reported, one by Guess (1926) and the other by Welz and Lieberman (1927). My own case, together with two similar cases in this city reported by M. P. Rucker, increases the number to 43.

CASE REPORT

Mrs. J. W. A. was of medium size, well built, aged twenty, primipara. Her husband was in good health. Family history was negative. She had had the usual diseases of childhood. Her past weight was 99 pounds; at six months of pregnancy she weighed 120 pounds. Her chief complaint during pregnancy was shortness of breath, and palpitation of the heart. I saw the patient at the hospital in consultation with Dr. J. A. M., because she was in labor for about twelve hours.

*Read at the staff meeting of the Retreat Hospital, Richmond, Va., November 17, 1930.

No fetal movement had been felt for the past two days. Physical examination was essentially negative. The patient was found to be about seven months pregnant and in active labor. Height of fundus was 24 cm. Fetal heart tone could not be detected. Vaginal examination revealed the cervix completely dilated and the presence of the amniotic sac bulging tensely. The sac was artificially ruptured with a sudden gush of a large quantity of liquor amnii (hydramnios), followed in ten minutes by the expulsion of a 5¼ pounds stillborn fetus (L. M. A.). An immature placenta was expelled unaided fifteen minutes later (Duncan method). Duration of labor was fifteen hours twenty minutes.

Laboratory findings were negative. The first specimen of urine revealed a trace of albumin, positive sugar, and a few pus cells; one week later the urine was negative.

Fig. 2.—X-ray—dorsal view.

Description of Fetus.—Pathologic report by Dr. Chas. Philips. Fetal monster, white, female, 29 cm. long; extremities well formed and normal; arms well formed but unusually long and with large hands and fingers. The head, neck, shoulders and chest were deformed in that the head and neck were short and thick; there was a large cystic mass projecting backward from the brow and extending down to the level of the 12th rib over the spine at what ought to have been the level of the 2nd lumbar vertebra. There was the beginning of a bifid spine with apex of a wedge-shaped area below at this point which rapidly widened until at the junction of the deformed head with the

spine there was an opening of 2.5 cm. across the edges. This gap was covered with thin eroded skin and felt soft and cystic to touch. There was practically no brow because of the slope backward. From the opening of the posterior fontanelle backward to the divergent place of the bifid spine there was a soft cystic mass of an apparent encephalocele and spina bifida combined with apparent absence of the occipital bone. The shoulders were pushed forward by this mass and the lateral margins of it were the scapulae. The shoulders measured 8.5 cm. across and the head at the same level, 7 cm. The distance from the brow to the lower level of the cystic mass was 10 cm. and this gave a

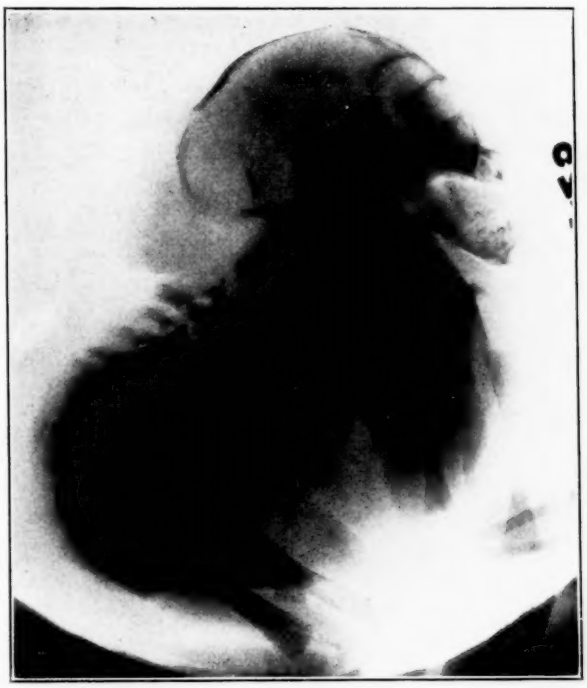


Fig. 3.—X-ray—lateral view.

circumference of 28 cm., just 1 cm. below the total length of fetus. The occipitomental diameter if there were an occiput would be 10 cm. At the level of the shoulders the circumference was 32 cm. while that under the arms was 28 cm. The legs measured 10.5 cm. from trochanter to heel, while the arms measured 16.5 cm. from acromion to the finger tips. Some material was aspirated by needle from the cystic head mass for microscopic examination.

The placenta of this fetus, which was elongated rather than round and measured 15 by 7 cm., was dark red and firm. The general development and structure were grossly normal except for the size. Weight was 200 gm.

Microscopic Description.—Aspirated material from the back of the cystic portion of the head mass showed brain tissue. The placenta showed immaturity of development and a marked active and passive hyperemia with blood stagnation; there were few areas of hyalinization and a little calcification.

X-ray Report.—The occipital region was rather distorted. There was a congenital malformation of the bodies of practically all of the upper and middorsal vertebrae and no spinous processes or laminae were detected in this region. The probabilities are that there was a large spina bifida in this region. Nothing of definite clinical significance was noted in the spine from the first lumbar downward. It is difficult, however, to give any definite opinion as at this age of fetal life, the vertebral epiphyses are all separated.

Postmortem examination revealed the following: Absence of occipital bone; posterior superior surfaces of parietal bones well marked. In place of occipital bone there was found a tough reflexion of dura. Frontal lobes cone-shaped running toward orbits; wide spina bifida; large diaphragmatic hernia (left); stomach and spleen in chest compressing lung inward. Right chest grossly normal. Uterus, tubes, and ovaries normal; kidneys present and normal. Intestinal tract and liver grossly normal.

Diagnosis.—Iniencephalus and spina bifida monster; immature placenta; hydramnios.

An early diagnosis is always essential to insure the proper management during labor. In addition to that of being in the class of pathologic freaks and curiosities, these fetal monstrosities frequently present problems of no little obstetric importance.

301 E. Franklin Street.

Malan, G. M., and Mackintosh, R. H.: Abscess in Abdominal Wall Simulating Ruptured Ectopic Gestation. J. M. A. of So. Africa 24: 628, 1930.

A case is reported of a young girl who had skipped a period and who following a fall developed a localized tender mass over the right lower quadrant of the abdomen suggesting a ruptured ectopic pregnancy. On incision this mass was found to be an extraperitoneal abscess. The author attributes its formation to rupture of the deep epigastric artery as the result of the fall with subsequent infection of the hematoma. After incision and drainage recovery was uneventful.

Frank Spielman.

MENINGO ENCEPHALOCELE WITH MICROCRANIA

By J. L. Reycraft, M.D., Cleveland, Ohio

(Department of Obstetrics and Gynecology, Western Reserve University)

THE case to be presented occurred in private practice, the patient being referred to us for maternity care by her family physician August 5, 1929.

Mrs. C., para i, aged forty-six, married eight years. An ectopic pregnancy of two months operated upon in 1923. Her appendix had been removed several years before this. She was a large woman, height five feet seven inches, normal weight about 160 pounds. The menstruations had always been regular until March 6, 1929, after which there had been none. Upon examination the uterus was found to be the size and consistency of four and one-half months' pregnancy.

The course of her pregnancy was marked by attacks of low bilateral abdominal pain, and at seven months she had a mild attack of pyelitis which responded quickly to rest in bed and the administration of diuretics. The abdominal wall was so firm and thick that palpation of the fetus was always difficult. This was made more so by the presence of bowel anterior to the uterus probably adherent to the old appendectomy scar. The fetus was active, but the heart sounds were always heard with difficulty.

Fig. 1.

November 5, 1929, the uterus was no larger than a seven and one-half months' pregnancy. On November 27, the membranes ruptured spontaneously, and the following morning she was admitted to Maternity Hospital, having contractions every five minutes.

Rectal examinations at first showed no dilatation of the cervix and the presenting part seemed soft enough to suggest a breech, though no head was palpable in the fundus. Twelve hours after admission the contractions almost ceased and an internal examination was made under nitrous oxide anesthesia. We found the os dilated four cm. in diameter but very thin, and the fetus presenting by the face, right mentoposterior. An unusual sensation was experienced when the right eye of the fetus and the nose were felt, but the left eye was missing. Furthermore the mouth was not of normal contour, so the presence of a monster was suspected.

Delivery was effected with much difficulty, after dilating the cervix manually, when it was discovered that there was an internal contraction ring present just at the level of the baby's neck. Under deep ether anesthesia we were able to overcome this obstruction and deliver the baby by means of podalic version. It lived nine hours after birth. The mother made an uneventful recovery.

The fetus was photographed and x-rayed and then turned over to Doctor Zuck

of the Department of Anatomy for further examination. We are indebted to Doctor Zuck for the notes on this examination, which follow:

"Specimen is that of a full-term male fetus, white. The head has two periform protrusions arising from the left frontal and left parietal regions measuring 6 × 8 × 10 cm. and 8 × 10 × 14 cm. respectively. These are covered by skin, are freely mobile and fluctuant. There is dura matter beneath the skin with some hemorrhage subdurally, and both sacs nearly filled with brain substance not attached to dura. The brain was found to be continuous into the cranial cavity and the margins of the attachments of the sacs to the scalp and underlying tissues was found to be formed by a dense ring of connective tissue. Both eyes are present, the right quite superficial and completely formed; the left diminutive and buried laterally beneath the anterior encephalocele. The inferior orbital fissure on the right opens through to the cavity of the mouth, there being a complete cleft in the palate. There is a harelip on the left but no underlying deformity in this region. The premaxilla is tipped up somewhat, its right margin elevated due to the failure of fusion with the maxilla on the right.

"There is an associated clubbing of the second and third digits of the right hand with fusion in the region of their proximal phalanges. The second digit on the left has no nail.

"There is a bilateral talipes equinovarus."

This case was of unusual interest to us inasmuch as at first it appeared to be a type of cyclops but the anatomical study proved that the second eye was present although the left one was not developed. A similar case has been described by Dr. Ernest Schwalbe in his *Die Morphologie der Missbildungen*, Jena, 1906, pp. 144, 196.

610 Hanna Building.

PAROTID SWELLING ASSOCIATED WITH LACTATION, WITH THE REPORT OF A CASE

By Lyle G. Phillips, M.D., Honolulu, T. H.

ENLARGEMENT of the parotid glands occurring simultaneously with and definitely related to functional activity of the female breasts is a condition not included in the usual classifications of parotid swellings. Questions histologic, pathologic, and embryologic, which observance of such a phenomenon stimulates, prompt reporting the following case:

Mrs. W. G., aged twenty-four, Anglo-Saxon, came to me in July, 1927, for obstetric care. She was then in the eighth month of her first pregnancy. Her condition was normal with the exception of slight swelling of the left parotid gland. This swelling, she said, first appeared about the time of the establishment of the menstrual function. There was no associated discomfort, and palpation indicated a uniform enlargement of the entire gland. Mrs. G. was confined on July 15, and three days later the breasts became engorged. At the same time both parotids became acutely swollen, the patient presenting the classical picture of acute epidemic parotitis. Both glands were uniformly enlarged, the lobes of the ears protruded, the skin over the glands was stretched tight and shiny, and there was some discomfort associated with movement of the mandible. No rise in temperature occurred. Except for the disappearance of discomfort, this condition persisted, unchanged, during the eight months the patient nursed her baby. At the end of this

time she was advised to wean the child. Nursing was stopped, the breasts were bound for forty-eight hours, and lactation was terminated. Immediately, complete involution of the parotid swellings occurred, and both glands became normal in size.

In January, 1928, Mrs. G. again became pregnant, and during the last trimester of her pregnancy became conscious of renewed activity in the parotids. There was but slight swelling, however, until, on the third day following delivery, engorgement of the breasts and acute swelling of the parotid glands again occurred simultaneously. The swellings again persisted throughout the period of lactation, and disappeared promptly when lactation was terminated.

During neither of these experiences was the character of the salivary flow abnormal.

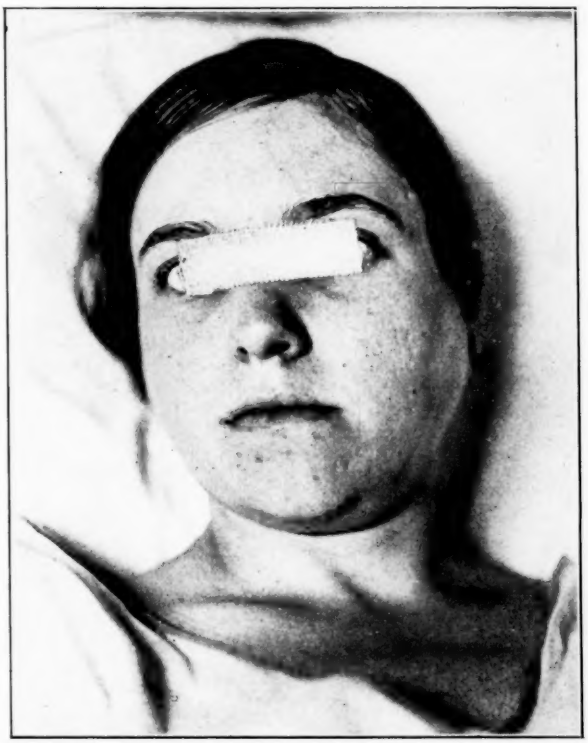


Fig. 1.—Showing parotid gland swollen after onset of lactation.

Why glands unrelated to the breasts both in embryologic development and in physiologic function should behave thus in connection with lactation is a difficult question to answer. Aberrant mammary tissue is frequently found elsewhere than in the breasts, but no reports are known to me of these being located anywhere except in the so-called crista lactea, running from the axillae diagonally onto the abdomen. Biopsy has not been done in this case.

404 Dillingham Transportation Building.

SPONTANEOUS RUPTURE OF THE UTERUS FOLLOWING A WEDGE-SHAPED RESECTION OF THE FUNDAL PORTION

By Samuel S. Rosenfeld, M.D., New York, N. Y.

SPONTANEOUS rupture of the uterus is an infrequent complication of pregnancy. In a series of 417 cases of uterine rupture, Stein considered it spontaneous in 67 cases.

One of the commonest causes of rupture of the uterus during pregnancy is a weak uterine scar following cesarean section. Rupture also occurs acutely, in which case it is usually due to falls or direct injury to the abdominal wall. Ruptured uteri, which were treated conservatively, have been known to rupture during subsequent pregnancies. Peham, quoted by Munro Kerr, gives several instances of this accident. Any operation on the uterus that leaves a scar, or fixes the organ, renders it vulnerable to rupture should a pregnancy occur.

In spontaneous rupture, there is frequently no demonstrable uterine disease. The seat of the rupture is nearly always in the fundus. In women who have been subjected to cesarean section, rupture usually takes place in the scar. The incidence of rupture in placenta previa is somewhat higher than in cases where this abnormality is not present.

The case that I here report followed a wedge-shaped resection of the uterus.

Mrs. D. S., aged thirty-eight, was admitted to Lebanon Hospital on April 8, 1930, with the following history: She was perfectly well until a few hours before admission, when she experienced a sudden severe attack of pain, in the lower abdomen. The pain was not localized. She fainted several times. There was no vaginal bleeding. Her last menstrual period was in the latter part of January.

The patient was a para iv, gravida iii. Three children alive and well. Had one criminal abortion. Her menstrual periods commenced at the age of thirteen, were of the twenty-eight-day type and lasted seven days. She had always had dysmenorrhea. She was operated upon May 10, 1926, at which time a wedge-shaped piece of uterus, the size of an orange was removed from the fundal portion. The pathologist reported that the tissue removed was composed of uterine muscle with an increase of connective tissue in the musculature. At that time, the operator stated, he would have performed a hysterectomy, but for the fact that the intestines were firmly adherent to the left side of the uterus, both anteriorly and posteriorly. The patient made an uneventful recovery.

Operation, April 13, 1930. I made a median suprapubic incision and opened the peritoneal cavity. I found the cavity full of fresh and clotted blood. The fetus, in its sac, presented in the opening of the uterine fundus. The entire fundus was opened and the margins were very ragged. The uterus was entirely surrounded and buried by densely adherent intestines. The intestines that were adherent about the fundus were very thin and there was hemorrhage into the walls. I intended to perform a hysterectomy, but the patient was in such desperate condition, that

I did not think that she would be able to withstand a difficult hysterectomy with a possible bowel resection and anastomosis. The uterine fundus was sutured with interrupted chromic catgut. The sigmoid and omentum were fixed to the uterine wound. The right broad ligament and fallopian tube were also used to cover the uterine wound. A saline infusion was given while the operation was going on and a blood transfusion was given immediately following the operation. About 500 c.c. of saline was poured into the abdomen, before closing the peritoneal cavity. The abdomen was closed in layers.

For the first four days her condition was very satisfactory. She then began to vomit, and became distended. On the sixth postoperative day the distension was marked and the vomitus was coffee ground in character. She was deeply jaundiced and had marked dyspnea. The temperature was 101° F. She died on the eighth day following the operation.

Permission was granted for a partial autopsy and the following report is from the pathologist's proctocol: Well developed female, with marked pallor of the mucous membranes, an icteric tint to the skin, the abdomen was markedly distended and tympanitic. There was a clean operative wound in the mid-suprapubic region.

In the peritoneal cavity there was about 700 c.c. of dark brown blood fluid, and a few clots. All the intestines were markedly distended. In the lower abdomen all of the bowel was blood stained. In the upper abdomen some of the bowel was blood stained. The uterus was the size of a large orange. The superior surface was necrotic, greenish, and foul smelling. Adherent to this part of the uterus, there was the edge of the great omentum, and the right fallopian tube, both of which were necrotic. The ileum, about six inches from its junction, with the cecum was also adherent to this necrotic area. The adherent ileal wall was itself necrotic and when gently separated, this area was seen to be ragged and about the size of a half dollar, with the lumen of the ileum exposed. Just below and posterior to the necrotic surface of the uterus, the lower end of large bowel was adherent to the uterus by dense fibrous bands, causing a transposition of the rest of the colon to the right side of the pelvis, where the entire pelvic colon was situated. The stomach was normal in size and contained a dark brown liquid, which gives a strongly positive test for blood. There was no ulceration. The mucosa of the small bowel was smooth and not ulcerated. In a few areas, there was intense congestion. The terminal ileum, the cecum and ascending colon, contained a dark red, bloody liquid. When opened longitudinally, the uterine cavity was small; and posteriorly and on the left side, there was a projection upward of the cavity, resembling a horn, the top of which was necrotic, so that a probe could be passed directly through the necrotic area, to which the bowel and omentum had been adherent. This had been the point of perforation. The cavity itself was clean and only slightly hemorrhagic. The wall of the uterus, except at the point of perforation was thick and fibrotic. The left tube and ovary were normal. The right adnexa were extremely congested and the terminal portion of the tube was incorporated in a mass on the top of the uterus, together with the bowel and omentum. The urinary bladder was normal. The liver was normal in size and the surface smooth. The gall bladder was distended and contained dark green bile. There were no gallstones. The extrahepatic ducts were normal. The liver on section was pale, icteric and spotted with areas that appeared to be fatty. There were no abscesses or necrotic areas. The spleen was small and normal in appearance. Both kidneys were pale, icteric and normal in size. The capsules striped easily, leaving a smooth surface. The markings were distinct and the cortex of normal thickness. The lungs were both free in the pleural cavity, and showed congestion of the bases. The heart was normal, except for slight sclerosis at the base of the aorta. The myocardium was pale, and the wall in the right ventricle rather thin. On microscopic examination, the spleen showed slight congestion. The kidney showed no

pathologic change. The liver showed cloudy swelling and beginning fatty degeneration. The lungs showed intact alveolar walls and the alveolar spaces were filled with many blood cells. The heart showed no pathologic change. The uterus showed a musculature that was diffusely infiltrated with many pus cells. There was a moderate degree of fibrosis.

Pathologic Diagnosis.—(1) Necrosis and degeneration of the uterus and ileum, (2) peritonitis, (3) congestion of the lungs and fatty infiltration of the liver with cloudy swelling.

REFERENCES

Goldstein, Leopold: M. J. & Rec. **120:** 156, 1924. *Goodman, Charles:* J. A. M. A., Oct. 14, 1924. *Markoe:* Bull. Lying-In Hosp., April, 1916. *Scott, William A.:* Am. J. Obst. & Dis. Women **76:** 1917. *Waldo, Ralph:* Am. J. Obst. & Dis. Women **62:** 1910.

2021 GRAND CONCOURSE.

TRANSPLANTATION OF AN URETER INTO THE SIGMOID IN A PATIENT WHOSE OTHER KIDNEY WAS FUNCTIONLESS. PRIMARY RECOVERY*

BY JAMES M. PIERCE, M.D., ANN ARBOR, MICH.

(Associate Professor of Obstetrics and Gynecology, University of Michigan)

IN A PAPER, "Operations upon Solitary Kidneys and Ureters," Walters and Wright reported that Coffey had transplanted a solitary ureter in two cases and Hunt had transplanted another in one case. In these cases it was known that only one kidney was functioning. In the case reported here a single ureter was transplanted without knowing that the other kidney was not functioning. This was due to the fact that the patient withheld some valuable information and because the bladder was so badly torn that the ureteral orifices could not be located by the urologist.

Mrs. E. H., white, married, aged thirty-seven years, entered the clinic August 15, 1929, complaining of urinary incontinence.

During the patient's thirteenth delivery in February, 1925, the base of the bladder and urethra were torn away by forceps. An attempt was made to repair the bladder in July and October, 1925. Both attempts were unsuccessful. Since that time the perineum had become very tender, there had been some pain in the lower abdomen, and pain in the region of the left kidney. There had also been some blurring of vision accompanied by frontal and occipital headaches. During the past three months there had been some swelling of the ankles and dyspnea. The patient had lost about thirty pounds and believed she had become generally weaker.

Examination showed a well-developed, overnourished adult female who appeared at least ten years old than her stated age (thirty-seven years). She did not appear to be acutely ill and cooperated well throughout the examination. The general examination was entirely negative except for some left costovertebral tenderness. No edema of the ankles. Blood pressure 125/75 mm. Hg.

Pelvic examination showed a marked hypertrophy of the labia minora with reddening of the labia and skin of the thighs due to the irritation of the urine coming from the vagina. There was a relaxed perineum with rectocele. The urethra was absent and the vaginal surface of the bladder absent. There was much scar tissue about the fistula which extended up to the cervix. The cervix had a

*From the Department of Obstetrics and Gynecology of the University of Michigan.

deep bilateral laceration with eversion, erosion, and chronic endocervicitis. The fundus uteri was forward, normal in size and freely movable. The appendages were not palpated.

A diagnosis of vesicovaginal fistula was made and bilateral ureteral transplantation was advised.

The patient was then referred to the Department of Genito-Urinary Surgery for examination of the ureters and kidneys. They stated that the ureteral orifices could not be found and that the condition of the ureters and kidneys could not be determined by their methods of examination.

August 24, 1929, the right ureter was transplanted into the sigmoid by the retroperitoneal method. The operation was made somewhat difficult by the thick panniculus. When the patient was returned to bed her temperature was 98°, pulse 92, and respirations 24.

Convalescence was rapid, highest temperature was 99.6°. There was good drainage from the rectal tube and the only complaint was abdominal distress due to gas pains. When the rectal tube was removed at the end of a week there was no discharge of urine from the vagina. There was considerable drainage from the abdominal wound. Ten c.c. of indigo carmine injected intramuscularly did not appear in either the vagina or abdominal wound, and the patient could control her urine.

The patient was then told that she must have had only one kidney or else the left kidney had ceased to function. She then informed us that she had been told that her left kidney had been destroyed "by stones or abscesses." When asked why she had withheld this information before her operation, she stated that she had also been told that if she gave this information we would not operate upon her.

The abdominal incision drained for several weeks and then closed completely. The patient had control of her urine but also had headaches and some blurring of vision.

The patient was not seen again until Dec. 31, 1930, when she was visited in her home. She still had headaches, blurring of vision and dryness of the mouth. She stated, however, that she did not feel any worse than before her operation. She is able to care for her family of six children and aged father and mother. She does not have to empty the rectum during the night and only at two- to three-hour intervals during the day. Blood pressure 190/96. A specimen of blood was obtained, nonprotein nitrogen, 51.4.

The internists do not believe that a blood nonprotein nitrogen of 51.4 means very much in these cases, because one cannot determine how much nitrogen is absorbed from the urine in the bowel. However, the high blood pressure would indicate a nephritis, which probably was present before the ureteral transplantation, and was aggravated by the operation.

Comment: This case demonstrates first that an ureteral transplantation can be performed successfully when there is only one kidney and secondly that our present methods of determining the amount of kidney function are very inefficient.

REFERENCE

(1) *Walters, Waltman, and Wright, William:* Surg. Gynec. Obst. **51**: 836, 1930.

TWO ADDITIONAL CASES OF ACUTE PUERPERAL INVERSION OF THE UTERUS TREATED BY ABDOMINAL REPLACEMENT

By Frederick C. Irving, M.D., and Foster S. Kellogg, M.D.,
Boston, Mass

HITHERTO we have traced the origin of abdominal reposition in acute inversion of the puerperal uterus,[1] described the technic and reported five cases so treated without mortality,[2] and classified the condition for treatment.[3]

We do not feel that a further article is warranted at this time. However in view of the rarity of the condition, the high mortality by other methods, the interest in it as shown by Findlay's recent paper and because one death was reported in 1929 in Massachusetts from this cause, we feel justified in reporting two additional cases in our series.

One of us (Kellogg) has somewhat modified the technic previously described. The inverted uterus is grasped at one cornu in the region of the ovary and tube and this portion of the uterus replaced with Allis forceps as in the original procedure. It was found accidentally that either with or just following the reposition of this portion of the uterus the other horn flops up itself. The advantage is fewer bites in the peritoneum and on the whole less traction force is necessary.

The following cases are reported unedited from the records of the Boston Lying-In Hospital.

Case 1 (Six in our series) (Irving).—Primipara entered hospital 7:20 P.M., April 14, 1928, in active labor with steady regular pains. She was given morphine and scopolamine. Head on perineum with fully dilated cervix at 2:20 A.M. Under gas-oxygen ether anesthesia, low forceps done after median episiotomy. Meconium stained amniotic fluid. Episiotomy wound repaired.

Placenta and membranes delivered intact twenty-two minutes later following moderate Credé. No more pressure was used than with other patients.

Following delivery a steady trickle of blood came from the vagina. Blood was clotted and did not appear fresh as from cervix, 1000 c.c. rectal saline. Blood pressure falling rapidly and pulse rising as fast.

A suggestion of a square topped uterus low down with a crater in middle suggested inversion.

Vaginal examination showed complete inversion with the rough interior of the uterus as big as an orange in the vagina. Hemorrhage continued during examination, patient rapidly grew worse.

Eight hundred c.c. intravenous saline was given following which blood pressure became perceptible and pulse a little stronger.

Vagina after examination was washed out with 3000 c.c. saline and 100 c.c. 70 per cent alcohol. Immediate laparotomy and transfusion started. Under gas-oxygen anesthesia, abdomen was opened, uterus found inverted, replaced by the usual technic, abdomen closed in layers without drainage.

Patient transfused again, 500 c.c. citrated blood. At end of hour blood pressure 100, pulse 124.

Convalescence nonfebrile, except slight temperature rise first two days, pulse never over 100.

Ready for discharge on fourteenth day. Kept on account of cardiac disease. Nursed the baby who gained.

CASE 2 (Seven in our series) (Kellogg).—Primipara normal in every respect, in labor nine hours. Head on perineum and starting to crown. Gas-oxygen and ether given. Head delivered with pressure on fundus. Cord around baby's neck, clamped and cut. Seen to be very short. Baby breathed immediately.

Placenta expressed following separation nine minutes after delivery of infant. On removal of placenta, uterus seen to be projecting through vagina, relaxed and inverted completely. Moderate bleeding. Attempt was made to reduce inversion by gentle pressure on the inverted fundus. Cervix contracted and prevented reduction. Bleeding was moderate. Vagina was packed with two three-yard strips. Patient in moderate shock with continued hemorrhage. Prepared for immediate operation.

Within one hour of the inversion gas-oxygen and ether, 5 inch median low incision. Uterus found partially inverted with tubes and ovaries drawn into the inversion, ovaries being at edge. Inversion readily replaced with Allis forceps in the usual manner. Uterus which was blanched at the beginning of the operation had its normal color immediately following replacement. Abdomen closed in layers without drainage.

During the hour between inversion and operation patient was in a fair amount of shock with a rapid fairly thready pulse, around 130 and slight bleeding. (The anesthesia chart, however, shows that the anesthetist could not count pulse, though it was perceptible and that the blood pressure ranged from 72 over 50 to 52 over 40.) At end of operation the patient's pulse was better and her facies looked much better. However, she was given one 500 c.c. citrate transfusion.

Operation begun at 7:14 was finished at 7:37. Convalescence normal except for two-day temperature rise. Mother and baby discharged well.

We have now seven consecutive cases of acute inversion of the puerperal uterus treated by abdominal reposition without mortality.

It may be of interest to note that five of the seven patients were primipara.

We have nothing to add to our previously published comments except that with each experience we are more impressed with the simplicity and efficacy of this procedure.

REFERENCES

(1) *Huntington, J. L.:* Boston M. & S. J. **184:** 376, 1921. (2) *Huntington, Irving, and Kellogg:* AM. J. OBST. & GYNEC. **15:** 34, 1928. (3) *Kellogg, F. S.:* AM. J. OBST. & GYNEC. **18:** 815, 1929.

475 COMMONWEALTH AVENUE.
19 BAY STATE ROAD.

CONGENITAL HERNIA OF UMBILICAL CORD WITH EVENTRATION AND ABSENCE OF A SAC

By John F. Krumm, M.D., Chicago, Ill.

(Department of Gynecology and Obstetrics, Northwestern University Medical School)

THE case I am about to report is one of complete eventration, with a small abdominal opening and with no evidence of any form of a sac; the bowels undoubtedly had been floating in the free amniotic fluid during intrauterine life. As occurs in many of these cases, there were other associated embryonal defects and some of these probably explain the occurrence of the exaggerated conditions in this patient.

The patient was a primipara, aged twenty-six years. Family history was negative except that grandmother of child on paternal side had a slight shortening of one upper extremity. The Wassermann test was negative. She had a spontaneous miscarriage of eight weeks' duration in February, 1927.

Last menses occurred on July 4, 1927, calculated date of confinement April 11, 1928. Nausea and vomiting persisted until the end of the third month. Otherwise entire prenatal period was uneventful until onset of labor. Fetal heart tones were 144 at each visit, once every two weeks. Last visit was April 5, 1928, three days prior to onset of labor.

On Sunday, April 8, patient was taken automobile riding over rough streets with the idea of precipitating labor. Labor pains were first noted at 11 P.M. that same night, but they were so weak and irregular that she did not call the doctor until 8 A.M. the following morning, April 9. She was seen at 9 A.M. in the hospital and on examination the cervix was found to be dilated about one and one-half fingers and with very little effacement. Blood pressure was as usual, 110/72. The urine was negative. Pains were recurring every twenty-five to thirty minutes and of short duration. Fetal head was entered in pelvic inlet and position was left occipito-anterior. Fetal heart rate was 180 as compared to the former constant rate of 144. There was no vaginal show or other bleeding.

Everything appeared normal except the fetal heart rate and in view of the foregoing history the possibility of a partial abruptio placenta with occult bleeding was considered. There were, however, no other confirmatory signs.

The fetus without a doubt was in distress, but a rapid delivery could only be done by cesarean section. This was postponed and the fetal heart rate was taken every fifteen minutes without any change until complete dilatation occurred, and membranes were ruptured at about 5:30 P.M. Immediately following this procedure the fetal heart rate rose to 195+ as nearly as could be counted. Meconium now appeared at the vulva. An episiotomy and an immediate midforceps delivery were done, with a viable child born at 6 P.M.

Examination of the child revealed the stomach and coils of small intestines and cecum, greatly distended, and these as well as the liver and omentum, protruded from an umbilical opening the size of a silver dollar and passed alongside the umbilical cord. The cord divided just before entering the abdominal cavity. There were no evidences of a covering for the viscera; the peritoneum ended at the umbilical opening, and only the cord itself was covered with a membrane. The stomach and coils of intestine were matted together in places and when separated a fibrinous material was seen. The viscera were not hyperemic but simulated ordinary bowel serosa.

On inserting a finger through the umbilical opening only a very small shallow cavity was found, hardly large enough to admit even one-half of the distended stomach. Any attempt to replace the viscera under these conditions naturally was futile and so these were merely covered with moist warm gauze and the baby was placed in an incubator where it remained alive for eighteen hours.

Later examination revealed that there were five diverticulae the size of an average adult appendix, one on the posterior wall of the stomach and the rest along the intestinal tract. The transverse colon was severed in its midpoint by the mesentery and both ends were closed off blindly. The rectum was found to be a solid cord, the bowel above being normal but distended, and the anal canal below also appeared normal. Two toes of the right foot were webbed, and the left foot was almost amputated at the ankle as a result of the cord winding about at that point.

Probably the embryologic arrest of the rectum and the blind endings of the transverse colon accounted for the distention of the bowels. Even though the two edges of the abdominal wall came well together except at the umbilical opening, the bowels were too greatly distended to permit of their being drawn into the abdominal cavity, as in the normal case. Also this made it unnecessary for the abdominal cavity to develop at the same pace and to the same extent as the growth of the eventrated viscera and thus an artificial reduction of the hernia was made impossible.

It is also conceivable that the original sac which was undoubtedly present in early fetal life, ruptured, possibly under tension of the distended bowels, and subsequently its edges retracted and atrophied.

The etiology of the severed transverse colon and of the diverticulae is not as easily explained.

Fortunately in this case conservative obstetrics was resorted to, thus sparing the mother the added risk of a cesarean section.

From an embryologic standpoint this rare anomaly is especially of interest on account of the small abdominal opening associated with so marked an eventration. Also because of the contrast of the shallow abdominal cavity in comparison to the large viscera; and because of the absence of a hernial sac.

Clinically the case is interesting because of the absence of abnormal symptoms or signs until the onset of labor; and because of the difficulties presented in determining a suitable means of terminating labor.

This patient gave birth to a normal child in January, 1930.

4753 Broadway.

Davanzo: The Resistance of the Hemoglobin in the Gynecological Field. Ann. Obstet. e Ginec. **52**: 133, 1930.

The author, employing the Kruger method, affirms that the posthemorrhagic increase of hemoglobinic resistance observed in animals is not a constant finding in man.

Sydney S. Schochet.
Julius E. Lackner.

A VAGINAL SPECULUM FOR CAUTERIZATION OF THE CERVIX

By Richard Lifvendahl, M.D., Chicago, Ill.

(From the Department of Gynecology of the Post Graduate Hospital and Medical School)

CAUTERIZATION of the cervix uteri for endocervicitis, eversion, and inflammatory changes of the everted mucosa, polypi, and cystic degeneration, if not too extensive, can be done without any form of anesthesia and is now regarded as an office procedure. Ordinarily the metal bivalve speculum, widely opened, affords sufficient exposure of the cervix and retraction of the anterior and posterior vaginal walls to permit adequate treatment of the pathologic area. However, many patients complain of considerable local heat in the vagina, particularly if the Post cautery is used. In several instances this sensation has led the woman to believe that she

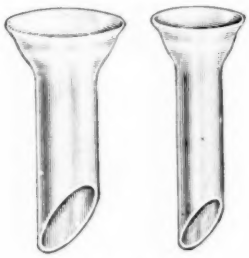


Fig. 1.

is about to be burned and has therefore attempted to "pull away," resulting in the cautery point touching the unprotected lateral vaginal walls, causing a painful thermal ulcer of three to six days' duration, at the same time leading the patient to discontinue further treatment.

A plain or "milk glass" Ferguson speculum would assure more comfortable treatment and prevent this accident from occurring; however, the possibility of the glass being "cracked" by the heat and leaving small fragments of glass in the vagina prohibit the use of this type of instrument.

The specula just referred to have the general outline of the older milk glass speculum but are constructed of very heavy Pyrex glass which serves as a protector of the entire circumference of the vaginal wall, exposing only the part to be treated, thus affording better opportunity for more complete treatment and preventing accidents.

Society Transactions

CHICAGO GYNECOLOGICAL SOCIETY

STATED MEETING, NOVEMBER 21, 1930

DR. J. P. GREENHILL demonstrated a specimen of **Krukenberg Tumor.**

A woman, 35 years of age, entered the hospital with a history of epigastric pain and belching for twelve years. Menstrual history was entirely negative. She had had two children. Physical examination revealed a small adenoma of the thyroid, a small mass under the skin of the chest just above the left clavicle, and two fairly good sized masses in the abdomen, one in each quadrant. On bimanual examination the cervix and uterus were both normal, but the two large masses were easily felt. In addition, in the posterior culdesac there was a small irregular mass, 2 cm. in diameter. The diagnosis before operation was malignancy of the ovary, most likely a sarcoma. At operation she had two smooth, hard masses in the ovaries. Both ovaries and uterus were removed. The small mass found on bimanual examination was adherent to the sigmoid and was difficult to remove. After operation examination of the tumors revealed them to be Krukenberg tumors. X-rays of the gastrointestinal tract taken after operation were entirely negative. The tumor mass above the clavicle will be removed later. She has had deep x-ray therapy over the mass adherent to the sigmoid, and it is difficult to feel it now. In spite of that, a proctoscopic examination will be made to discover, if possible, the source of this tumor. The chest and breasts are negative.

DR. IRVING F. STEIN AND ELIZABETH J. COPE (by invitation) presented a paper entitled **Trichomonas Vaginalis: A Preliminary Study.** (For original article see page 368.)

DR. EDWARD L. CORNELL, DR. L. J. GOODMAN AND DR. MABEL M. MATTHIES (by invitation) presented a paper entitled **The Culture, Incidence and Treatment of Trichomonas Vaginalis.** (See page 360 for original article.)

DISCUSSION

DR. WILLIAM H. TALIAFERRO.—To a protozoologist these two papers on Trichomonas vaginalis have touched on some extremely interesting points. In particular I refer to the questions of incidence, pathogenicity, treatment and specific differences of it and other human species. In discussing these questions, particularly that of pathogenicity, I wish to emphasize emphatically that you with your clinical contacts are the final arbiters, that protozoologists with their reliance on laboratory material and animal experiments can only make suggestive findings and wait for the final answer from you.

The question of the pathogenicity of all of the human trichomonads is a much debated question. Trichomonas hominis of the intestine on which most work has been done certainly occurs more frequently in persons with diarrhea than normal persons. A large number of protozoologists feel, however, that this is due to the fact that in disease there are more favorable living conditions for the flagellates and that they are easier to find in loose than in normal stools. In spite of much

work there are very few clear-cut cases pointing to pathogenic action of the flagellates. There are such cases as: Wenyon (1920) who found an invasion of the glands of the intestine, but this may have been a postmortem invasion; Kessel (1925) who reported Trichomonas in pus from a liver abscess, but here amoebae were the primary invaders; Wenyon (1926) who stated that in guinea pigs the Trichomonas often invaded the intestinal wall, but here we are not certain that it is the primary invader; and Kessel (1928) who found an actual colitis in kittens after infection with forms from man.

It seems to me that there are still some difficulties in accepting the pathogenicity of Trichomonas vaginalis. It is an exceedingly common parasite of women (incidence ranges in different studies from 10 to 60 per cent examined) and at times it is very difficult to find. In the diseased conditions described, may it not be a secondary invader, the diseased condition supplying a favorable environment and causing a light infection of the flagellate to flare up?

Treatment bears indirectly on the question of pathogenicity. In the intestinal form Hegner has shown that a high protein diet greatly reduces the infection. Here, apparently, the treatment changes the bacterial flora and indirectly affects the parasite. Similarly, Ratcliffe has found that certain of the resorcinol derivations are effective against the trichomonads of rats, but here again the effect is indirect through the action on the intestinal bacteria. In regard to the treatment described, is there a possibility that it is not affecting the Trichomonas directly but clearing up some other condition favorable for the flagellates?

The question of specific differences between the trichomonads from the intestine, mouth, and vagina is again a much debated question. Many protozoologists feel that the obvious differences found are due to differences in the food, etc., of the different sites. In this connection it is interesting that Hegner has been able to grow the intestinal and vaginal trichomonads of the monkey in cultures and to transfer the intestinal forms to the vagina in two of six cases.

Most recent workers have used Tanabe's (1929) serum-saline-citrate medium for cultivating both the intestinal and vaginal Trichomonas rather than the media stressed by the speakers this evening. In regard to solid media it is interesting to note that Miss Andrews (1929) developed two types for Trichomonas vaginalis. The first was an agar slope to which was added serum-saline-citrate solution and the second was an asparagin-agar slope to which was added rabbit's serum diluted with Ringer's solution and a few grains of rice starch. She also found that a P_H of 7.6 was the most suitable for growth.

DR. CAREY CULBERTSON.—I have said on previous occasions when I have discussed the subject that in my experience I have not found Trichomonas vaginalis to be a common thing. I have found these infestations uncommon but in view of the many reports that come from clinicians from all parts of the country whose interest, accuracy and enthusiasm cannot be questioned, it is very difficult indeed to deny the possibility of a specific entity either from the clinical or laboratory point of view.

I have the impression acquired from writers reporting these cases in South America that intestinal infestation is extremely common. One writer in the Argentine seems to take it for granted that the vaginal infection is a direct contamination from the intestinal tract. These writers do not seem to bring up the question of difference in the type of organism. There are some things in the pathogenesis that are worthy of note and that have not been mentioned. Most of the writers who describe this type of vaginitis state that the cervix is not involved. That is more important in the pathogenesis than we ordinarily think. It does not mean that a patient with a preexisting cervicitis may not acquire a trichomonad infection, but it means that in the absence of a preexisting cervicitis due to gonorrhea or some other type of infection, cervicitis is not acquired from

this type of vaginitis. In a recent paper Dr. Kleegman described what she calls erosions associated with trichomonads, but she does not say that she examined these areas histologically to be sure that they were what we ordinarily call erosions. Until we have a histologic study of these areas on the vaginal portion of the cervix in trichomonad infections we cannot say these are erosions. I would be much more apt to believe that they are localized inflammatory areas.

As regards treatment, practically every clinician has his own favorite method. Holden uses methylene blue and Lassar's paste. Dr. Cornell says he uses Lassar's paste in association with mercurochrome.

I cannot see any reason why the frequency of recurrence may not mean reinfestation, provided we can see no difference between the intestinal type of the organism and that recovered from the vagina. This idea is emphasized by Faulkner. He advocates greater care in cleansing the perineal region after bowel movement.

DR. CARL H. DAVIS.—We found that if dextrose broth were used as a culture media that one must constantly check it to be sure that the P_H remains practically the same as for human blood. As we checked it in our laboratory, as it is ordinarily made up there is too much difference in the P_H to use dextrose broths in culturing the organisms. So during the past year we have gone back to the use of Locke's solution to which we add 5 per cent of human blood serum and a moderate number of red blood cells. We have cultures from four separate patients who have been kept alive for four months.

Regarding the small areas that Dr. Culbertson mentioned, it is my opinion that they are areas of ulceration similar to those we see on the vaginal mucosa. I do not consider that they are in any sense comparable with the erosions in the cervical canal.

As far as treatment is concerned, I am not convinced that we have any treatment that is satisfactory for Trichomonas excepting so far as to avoid the use of irritating materials and keeping up the treatment over long periods of time, especially during the menstrual periods to avoid exacerbations which occur at that time. I do believe that a great advantage comes from the use of lactic acid just as soon as the acute symptoms have disappeared. There is a great difference of opinion as to whether the lactic acid helps restore the normal vaginal flora or whether it may have other effects. We know, in the first place, that lactic acid will not interfere with the normal vaginal flora. Most other materials used in the douche may interfere. In the second place, those of us who have used it know that when lactic acid is used as douche material we get a more extensive desquamation and it seems that this may be essential in producing a cure.

DR. J. P. GREENHILL.—The more I see of these cases the more I believe that the Trichomonas is a pathogenic organism, but whether it is the cause of the patient's disturbance it is hard to say. We know that if we treat the patients and get rid of the Trichomonas and with it the associated organisms, that the patients are cured or at least temporarily relieved. In that connection I would like to mention one case. This patient was under the care of Dr. Philip Lewin at St. Luke's Hospital for an arthritis of the right hip. I was asked to see her because of a vaginal discharge. I found Trichomonas and cured the condition after treatment. Strange to say, the arthritic condition improved so that she is now practically cured.

The source of infection or reinfection is very interesting. Dr. Cornell mentioned that in two patients sleeping in a bed that had been occupied by a patient with a vaginal discharge had produced the condition. Personally, I do not think that is true, because some men have been bold enough to take the discharge from one patient and transfer it into another patient, but have not produced a discharge.

I thought the areas of erosions referred to by Dr. Culbertson and Dr. Davis were hyperemic.

DR. CHARLES S. BACON.—In regard to pathogenicity, I would like to ask whether it has been shown whether the larger specimens of the Trichomonas vaginalis would change into the smaller ones of the intestine. Another thing, no attention has been called to the Trichomonas found in the oral cavity. I believe that it is rather frequently found, especially in patients with pyorrhea and gingivitis. It is a question whether that might not be the original source of the intestinal infestation as well as for the vagina.

DR. E. D. PLASS.—There are one or two things which have come out in our study of this infection which may be of interest with regard to the pathogenicity of the organism. The first is, that at the beginning of a profuse white leucorrhea one is very apt to have a high incidence of Trichomonas infection, the incidence disappearing as the discharge clears up. That is evidence, if it is evidence at all, in favor of the Trichomonas being a secondary invader as has already been suggested. It is essential to get the Trichomonas in pure culture. All the cultures which have been obtained so far I believe are mixed. The evidence obtained from inoculation is none too clear. If, however, we can succeed in getting the organism in pure culture and then perform a reasonable series of inoculations under known conditions of P_H and under known conditions of discharge, we should be able to show whether the organism is pathogenic or not.

The second observation is regarding treatment. I would like to add one factor to the long list Dr. Cornell has already used. It is arsenic in the form of one-half to two per cent solution of neoarsphenamine. I have tried it in one or two patients, and it seemed to be more effective than anything else. It is introduced on a tampon and can be left in for a considerable period without producing any irritation.

DR. DAVID A. HORNER.—I am interested in the use of ordinary water in the treatment of Trichomonas vaginalis. The vagina is thoroughly scrubbed out. All the folds of the vagina are distended so that there are no crypts for the organisms to hide in. Sterile water or plain ordinary tap water in large quantities should be able to kill the Trichomonas. The ordinary douche in the treatment does not seem to be sufficient, but if a long-continued douche, of five, ten, or twenty minutes, is carried on once or twice a day, the organisms will not be found when the patient returns for subsequent examination.

DR. STEIN (closing).—I would like to touch on one or two points, one made by Dr. Taliaferro that very likely the alteration of the condition of the vagina renders a favorable medium for the development of the large numbers of Trichomonas vaginalis. We have detailed the work of Dr. Andrews in our manuscript. We found that her method was fairly satisfactory. However, we feel that the medium we described was most satisfactory for the cultivation of the vaginal organism.

The reason for using a solid medium with liquid added to it, was that we found a great quantity of growth appearing in the solid medium under culture.

I agree with the question Dr. Culbertson brought up about erosions. I never looked upon them as true erosions.

We have found that the very stubborn cases that do not respond to ordinary office treatment, will sometimes respond to very vigorous treatment under gas anesthesia.

Dr. Plass's observations are most interesting. I have had no experience with Dr. Horner's method of treatment.

DR. CORNELL (closing).—In two cases I found plastic adhesions between the vaginal wall and the cervix following the brisk treatment of washing out the vagina. I agree with Dr. Horner that plain water will clear up the secretion for

a period of time, but I have not been able to cure a patient with plain water or any other method of treatment unless it has been carried out over a long period of time, that is at least six months.

DR. DAVID S. HILLIS presented a paper entitled, **The Diagnosis of Contracted Pelvis by the Impression Method.**

ABSTRACT

Though much attention has been given to the study of the various types and sizes of contracted pelves, we are still without a thoroughly satisfactory method for accurately determining the size of the head. A successful method to determine this relationship must include a consideration of the size of the head as well as the capacity of the pelvis.

Perhaps the most rational method of making this measurement has been suggested by P. Mueller and modified by Monroe Kerr.

A modification of the Mueller maneuver is here proposed. It is practically painless and requires no skill beyond that which may be acquired by the doctor in general practice. It is a diagnostic procedure which makes it possible at or before labor to separate all cases into classes: those in which it is known that the head will pass the inlet and those in which the mechanism is doubtful or impossible. It is not recommended as a substitute for the usual diagnostic methods but should be used in addition to them.

The application of this method presupposes a knowledge and use of the following facts: The important diameters of the head and the pelvis are the biparietal diameter and the true conjugate respectively. The successful passage of the head through the inlet depends upon the relative sizes of these two diameters. When the biparietal diameter has passed the true conjugate, bony resistance at the inlet has been overcome. When the lowest bony part of a moderately molded or unmolded head has reached a line drawn between the tips of the spines of the ischium, the biparietal diameter is passing the true conjugate. Allowance must be made for the caput succedaneum and thickness of cervix or lower uterine segment in front of the head. If a head lies lower than this level or can be impressed below this point, it is positive evidence that no bony disproportion at the inlet exists.

With the use of this method it has been shown that the widely prevalent idea that the head at term cannot be pushed downward any appreciable degree with the cervix undilated and the bag of waters unruptured is untrue. In approximately 90 to 96 per cent of all cephalic presentations at term, the lowest part of the head can be impressed to or below a line drawn between the tips of the spines of the ischium. This number, of course, includes those cases in which the head already lies at such a level.

With the patient in the lithotomy position on a table, not too high, the examining finger in the rectum locates the tips of the ischial spines and notes the relation of the lowest part of the baby's skull to a line drawn between them. The hand on the outside is placed above the breech of the baby and is sunk as deeply as possible toward the mother's spine, *the forearm parallel to the long axis of the mother.* Pressure is then made on the breech toward the inlet and the descent of the head noted with reference to the interspinous line, allowance being made for the thickness of the lower uterine segment, the cervix or caput succedaneum if present. To avoid traumatism and pain the pressure is begun gradually and after the maximum is reached is slowly released.

If the head cannot be impressed to the spines, an assistant places the palm of one hand flatly over the middle of the baby's back to prevent flexion and the fingers of the other hand placed palmar surface downward above the head over

the symphysis presses the head downward and backward in the axis of the inlet while the examiner makes pressure on the breech and notes descent with the internal finger. If the impression fails with the aid of an assistant a trial is made under a short surgical degree of anesthesia.

With the use of the method in several thousand cases by interns in the prenatal clinic and in the wards at Cook County Hospital, there has never been observed bad effects of any kind whatsoever to mother or babe.

If, after a fairly early rupture of the bag of waters in labor, the head cannot be impressed to or below the spines a cesarean section may be done at once and in our opinion with proper facilities at hand is justified.

DISCUSSION

DR. CHARLES B. REED.—For many years obstetricians of great repute and great talent have devised means for estimating the relationship of the head to the pelvis. It is surprising to me that none of them have happened upon or thought of this extremely simple maneuver which Dr. Hillis has shown us. Everyone who is interested in obstetrics will be able to use this method which requires no instrumentation assistance, with the greatest degree of certainty as to the results.

DR. A. F. LASH.—I have used this method for five years in private practice and at the Cook County Hospital.

DR. JOSEPH BAER.—I would like to ask Dr. Hillis to discuss for a moment the value of the impression method in connection with the flat type of pelvis and whether he believes that before labor it is possible to make sufficient pressure on the ovoid to throw the head into deflexion so as to get the head to sink into the enlargement left in the bitemporal relationship. My own practice has been the use of the Müller maneuver, which for many years I have used routinely in primiparas shortly before the calculated date of the onset of labor and I hardly ever find it necessary to use an anesthesia. Then having found the lateral disproportion, I have allowed the patient to go into labor and to await the test of labor. In other words, I have pretty nearly eliminated for myself the use of the Müller method or any other pelvic measurement method, relying on the onset of labor and the early hours of labor to tell me whether or not there is going to be a disproportion.

DR. W. C. DANFORTH.—I have not had great experience with the method in women not in labor. I have used it in women in whom dilatation was almost complete and found it a very valuable maneuver. I hardly think the 5 per cent in which he states the head cannot be impressed should be considered immediately as candidates for cesarean section, and I do not think Dr. Hillis wished to give us that impression, because we have all seen cases in which the head does not enter the pelvis until late, and we all wait for molding to occur in cases of relative disproportion. In cases where we do not get the head I would still be inclined to wait for the test of labor. I think Dr. Hillis has been rather conservative in the test of labor, because we have had no difficulty in using a rather complete test of labor in conjunction with low cervical section.

DR. HILLIS (closing).—Dr. Baer referred to caput succedaneum. I also know there is no caput succedaneum when the patient is not in labor, but evidently Dr. Baer did not understand that this method was expected to be used after the patient had entered labor, in which case there might be a very considerable caput. With a reasonable type of flat pelvis, the maneuver has been used only as a diagnostic procedure. It is my personal belief that if we restrict our cesarean sections to disproportion cases, where we cannot press the head to the spine after labor has started, we would see very much fewer unjustified cesarean sections than we do today. We know that when the head has to be molded a great deal in order

to get it through the pelvis, the danger of cerebral hemorrhage is great, as is the danger of vesicovaginal fistula, which happened in one of the cases I mentioned.

Dr. Danforth's experience with the almost complete test of labor, as he reported some months ago before this Society, is most excellent, but such a series of results would not be possible in less expert hands.

THE OBSTETRICAL SOCIETY OF BOSTON

STATED MEETING, NOVEMBER 18, 1930

DR. R. S. TITUS read a paper entitled **The Detection of Impending Intrauterine Death.** (For original article see page 382.)

DISCUSSION

DR. LOUIS E. PHANEUF.—Dr. Titus has emphasized intensive, intelligent prenatal care, which means more than routine examinations during pregnancy. Obviously it is always a sad thing if a woman loses her unborn child, but how much sadder it is for a woman who falls in the group of the diabetic, toxemic, nephritic, or habitual miscarrier, one who carries a pregnancy with some danger to herself, and loses her baby before it is born, when it might have been saved by prenatal care.

At the Prenatal Clinic of the Carney Hospital, which has existed for twelve years, we have insisted on seeing these patients every two weeks. I discovered that one month was too long, that toxemia might develop unnoticed, and in the last five or six years I have insisted on seeing patients every two weeks.

Dr. Titus had emphasized the absence of growth or retrogression, the absence of increase in weight or the loss of weight of the patient under observation. It is true again that we weigh patients routinely during prenatal care but most of us who are doing it are not doing it with the point of view of preventing intrauterine death but merely to prevent the patients by diet, etc., from having over-large babies and complicated labors, so while we are taking the weights for these cases, it will be well to bear in mind the three points mentioned.

DR. D. L. JACKSON.—From my personal observation, I believe that shrinkage in the size of a baby is observed not only in cases showing toxemia before they are due but it is also seen in cases which may be or are thought to be overdue. We see not infrequently in cases which are overdue, shrinkage of the uterus, and at delivery get a baby which has quite evidently lost weight. On delivery of the placenta we find an afterbirth showing marked calcareous deposits which has commonly been termed a ripe or over-ripe placenta, and which has degenerated to such an extent that it does not give the baby sufficient nourishment.

DR. STEPHEN RUSHMORE.—I have noticed in a number of cases in my own practice that the uterus does not seem to enlarge as it should and that the patient does not gain weight or perhaps loses a little weight and in some of these cases I have been able to detect no trouble and the patient has delivered herself at term of a live baby, so the observations to which he calls attention are susceptible of different interpretations.

DR. S. R. MEAKER presented a paper entitled **Leiomyosarcoma of the Uterus.** (For original article see page 400.)

DISCUSSION

DR. F. B. MALLORY.—The statistics of the Pathological Laboratory of the Boston City Hospital for the last thirty-three years disclose 2439 cases of

leiomyoblastoma. Under that term are included both the slowly and the rapidly growing forms. These are differentiated, according to the only criterion which we can use, that is the presence or absence of mitotic figures, into leiomyomas, 89 per cent, and leiomyosarcomas, 11 per cent. That proportion varies in different laboratories. If you do not hunt for mitotic figures you often do not see them. One laboratory found 13 per cent of cases in which mitotic figures were present.

Taking first the slowly growing forms, there are 2177, of which 1940, or 89 per cent, were in the uterus, while 237 tumors, or 11 per cent, occurred in other parts of the body. Of the leiomyosarcomas, those in which mitotic figures were present, 220 (84 per cent) were in the uterus, while 42 (16 per cent) occurred elsewhere in the body. Recently my chief assistant has been calling leiomyosarcomas, leiomyomas so as not to scare the clinicians. Of the leiomyosarcomas in the uterus, only about 1.5 per cent were distinctly malignant, invading the wall of the uterus or giving rise to the metastases. Outside of the uterus, that is in the gastrointestinal tract, kidneys, and elsewhere, a much larger proportion of the leiomyoblastomas are malignant.

The first distinctly malignant leiomyoblastoma of the uterus which I saw projected from the cervix into the vagina. It was supposed to be a blood clot, but proved to be a very rapidly growing leiomyosarcoma with tumor giant cells. In another case which grew rapidly and invaded the uterine wall, the cells varied from spindle to round, and there were many tumor giant cells. The most famous case in our series was one which was diagnosed originally at another laboratory as multiple leiomyoma. Later the patient was operated upon at the Massachusetts General Hospital for a tumor pressing on the cervical cord. Still later, an autopsy was done by one of my assistants and metastases were found in the liver, lungs, bone marrow, and also in one orbit pressing the eye forward.

DR. FRANK A. PEMBERTON.—Clinically these tumors are usually benign and the proportion of the sarcomas depends on the standards of malignancy used by this individual pathologist. At the Free Hospital for Women there were 14 leiomyosarcomas in 2991 cases of fibroids between 1905 and 1927, that is 0.6 per cent.

Our standards of what constitutes malignancy are more strict than the average. We thought six were dangerous. Two could not be traced; one had a hysterectomy and was well thirteen years later: one had a myomectomy followed by radium three weeks later and was well five years later; one had a hysterectomy and when seen eight months later had ascites, pelvic pain and evidently a recurrence; one had a myomectomy followed by hysterectomy one month after and was well a year later.

The point that interests us as surgeons is what to do at the time of operation. I believe every fibroid or fibroid uterus should be opened immediately after removal. If it is soft, gray in color, friable, frozen section should be made. If that shows the irregularities, inequalities in size, arrangement and shape of the cells and mitotic figures that Dr. Meaker has spoken of, a complete hysterectomy should be done. If the cells grow regularly, with a few or no mitotic figures, it may be considered sarcoma but if the patient is young and wants children it is safe to leave the uterus in provided she is kept under observation.

I have one patient who had radium for fibroids when she was about forty years old and nine years later she came back, having flowed a little, and I supposed she had cancer of the fundus. I did a dilatation and curettage, and examination of a tiny piece of tissue showed leiomyosarcoma. I did a complete hysterectomy and the full pathologic examination corroborated the first diagnosis.

DR. JOE VINCENT MEIGS.—I looked up the records of the Massachusetts General Hospital for the last twenty years. Out of 1433 hysterectomies for fibroids, 23 cases showed definite leiomyosarcoma or a percentage of 1.6 per cent.

In the last two years, in private practice, there have been 5 cases reported as leiomyosarcoma, microscopically malignant only, one of them from the cervix.

Of these 23 cases from the Massachusetts General Hospital, 6 patients are known to be alive and well, or 26 per cent of the number. The operations done on the 6 living patients were supravaginal hysterectomies in 4 instances, a total hysterectomy in one, and a removal of a pedunculated tumor in the other. Four patients died as a result of the operation, two of general peritonitis, one of metastasis, and one because of very extensive disease. The average life of 9 patients who died later of the disease was one and one-half years. Ten patients had had children, thirteen had not had children. Nine patients were between forty and fifty years of age and 9 were between fifty and sixty years. Sixteen patients had abnormal menstruation of some type; 12 had pain; 10 had a palpable tumor; 7 had a foul discharge; 4 reported loss of weight, and 9 were pale and anemic.

The pathologist reported 17 cases as leiomyosarcoma of the uterus, one as leiomyosarcoma of the cervix, 2 as endometrial sarcoma, and 2 as spindle-cell sarcoma. The cervix was involved in 4 patients. There were 2 leiomyosarcomatous polyps. Five patients showed metastases including the omentum, retroperitoneal masses, the bladder, intestines and peritoneum.

One case of leiomyosarcoma of the cervix was diagnosed on two separate occasions as rapidly growing epidermoid carcinoma of the cervix and was treated without effect by radium. Finally the cervix was amputated and the pathologist at last reported the tumor as a leiomyosarcoma. One patient had a large, massive recurrence in the pelvis and was given deep x-ray therapy. Two days following the last treatment she developed a large abscess which was drained and much necrotic tissue removed. Six months later she was alive and was given another series of deep therapy, again seven days after her last treatment she was reoperated upon for recurrence of the pelvic abscess, and again large tumor masses were removed from the abscess cavity. This patient has since died of the disease. One patient was given gold radium seeds in the vagina for a recurrence following a total hysterectomy without effect. In none of the living patients has x-ray or radium been used. Two cases of polypoid leiomyosarcoma seen at the Pondville Hospital (Massachusetts State Cancer Hospital) recently were given intrauterine radium treatment; both tumors have recurred and both patients have died.

DR. STEPHEN RUSHMORE.—Dr. Mallory's thumb-nail test is useful, of course, but as he would acknowledge, it is of limited applicability. The thumb-nail test might make one suspect malignancy under a number of other conditions, for example, edema. I think a somewhat more satisfactory gross test is the appearance of the tissue if examined in a good light. If we find homogeneous areas of considerable size, that is, as large as a quarter or three-eighths of an inch in diameter, without the whitened areas of the trabeculae of the fibrous tissue, we are quite certain that there is a considerable proportion of myomatous tissue there. I mean the myomatous cells will be found under the microscope in considerable abundance and these are the suspicious evidences which should be examined under the microscope and in which we are more likely to find mitotic figures. If one finds an area of an inch or two in diameter which is homogeneous in appearance, we are most certain to find sarcoma of the uterus.

BROOKLYN GYNECOLOGICAL SOCIETY

STATED MEETING, FEBRUARY 6, 1931

DR. WILLIAM C. MEAGHER reported **A Case of Large Teratoma of Ovary, First Noted Eight Years After Menopause.**

Teratoma of the ovary is by no means a rare condition. However, in this case the condition was first detected in the patient long after the menopause. According to Lynch, "it is a disease of youth and middle age," and rarely does the tumor reach the size of that found in this patient.

Mrs. C. S., white, fifty-two years of age and married twenty-five years, was admitted to St. Catherine's Hospital Sept. 18, 1930. She complained of swelling

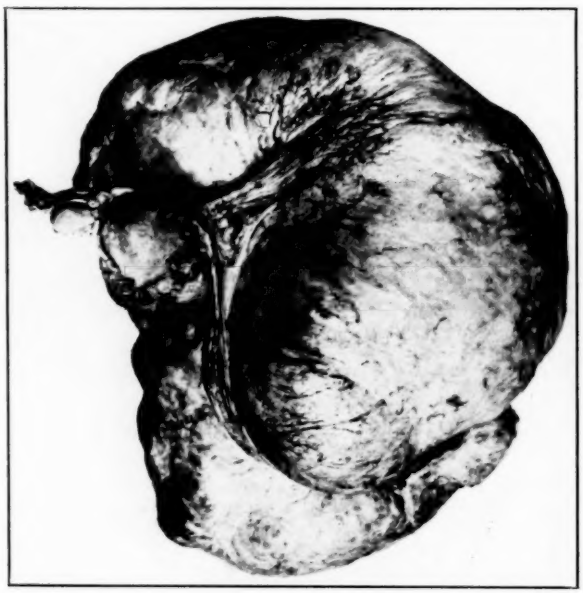


Fig. 1.—Specimen removed at operation.

of the abdomen and legs, and loss of weight for the past two years. A few months previous to admission she noted that her abdomen was gradually becoming larger and her legs began to swell. She had occasional attacks of pain in the upper abdomen on the right side. This pain did not radiate and was dull in character. She stated that she had lost a considerable amount of weight but did not know how much. She had occasional burning on urination and her bowels were fairly regular. Her menopause occurred uneventfully eight years ago and her menstrual history was negative. She complained of some dyspnea, more pronounced while lying down. Her past medical and surgical history were negative. She had one child eighteen years previously. This child was full term and the delivery and puerperium were normal. The child, however, has always been mentally

defective. She had no other pregnancies. On physical examination the patient appeared cachectic and anemic, although apparently not acutely ill. Her blood pressure was 156 over 88. Many fine crackling râles were heard in the anterior left chest, from the second to the sixth interspace at the costosternal junction. Throughout the entire chest were heard scattered râles which appeared and disappeared on change of the patient's position. The chest findings suggested a metastatic condition involving glands of the hilus of the lung or a low grade pneumonic process. Many of the transient râles were due to compression from fluid. The heart was slightly enlarged but there were no murmurs. The abdomen was enormously distended with free fluid, but there was no undue tenderness. No tympany was noted anywhere in the abdomen. A large hard ballotable tumor occupied the lower half of the abdominal cavity. The extremities were thin and emaciated but otherwise negative except for edema of the ankles.

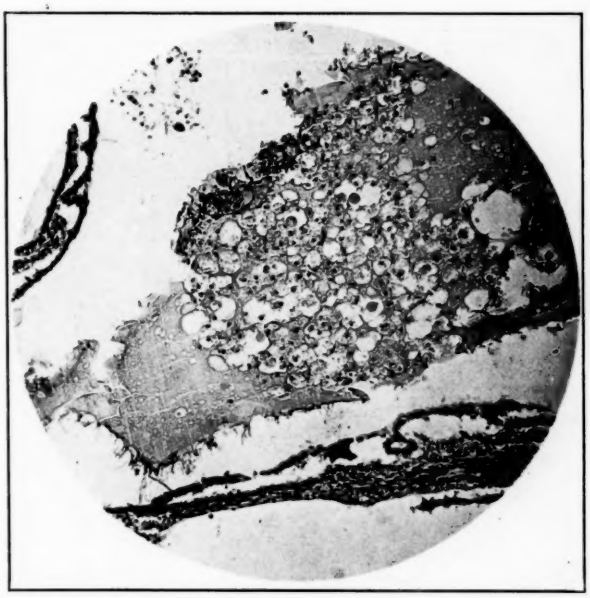


Fig. 2.—Microscopic section of tumor showing colostral cells.

Several uranalyses were done and all were negative. The specific gravity ranged from 1015 to 1022. Repeated blood counts showed the red cells to remain between 4,000,000 and 5,000,000 and the whites to decrease from 26,000 to 12,000 with an accompanying decrease in polys from 90 per cent to 86 per cent. The hemoglobin remained constant at 75 per cent. The sedimentation time was seventy minutes. X-ray of the chest was negative.

The patient was kept in bed until October 2, when all the chest signs had disappeared. Operation was performed on that day. An intraspinal injection of 150 mg. of novocaine was given, and a medium incision was made from a point two inches above the umbilicus to the pubes. Three gallons of straw-colored fluid was aspirated from the abdominal cavity and a large solid tumor of the left ovary was found. This tumor was adherent, at its upper pole, to the large omentum. The uterus and right tube were normal. The right ovary was small and fibrotic. The left tube was elongated, stretching over and adherent to the tumor. The uterus

was removed supravaginally with both tubes and ovaries after separating adhesions of the tumor and omentum. Bleeding was controlled, round ligaments sutured to cervical stump, and raw surfaces peritonealized. Wound was closed in layers and a tight dressing with a large abdominal pad was applied.

The postoperative course was uneventful. The incision healed by first intention, and the patient left the hospital on Oct. 19, seventeen days after the operation.

On examination, the specimen consisted of a uterus and right tube about normal in size. The right ovary was small and fibrotic. The left tube was stretched over and adherent to a mass measuring $32.5 \times 25 \times 15$ cm. in its various diameters. This mass was solid and hard and weighed 20 pounds. Microscopic examination of sections taken from the mass showed a diffuse structure composed of glandular acini, some of which were dilated to form small cysts in which there were found cells resembling colostrum. There were also areas showing diffuse irregular growths of epithelial cells, apparently epidermoid in character. The structure was that of a teratoma.

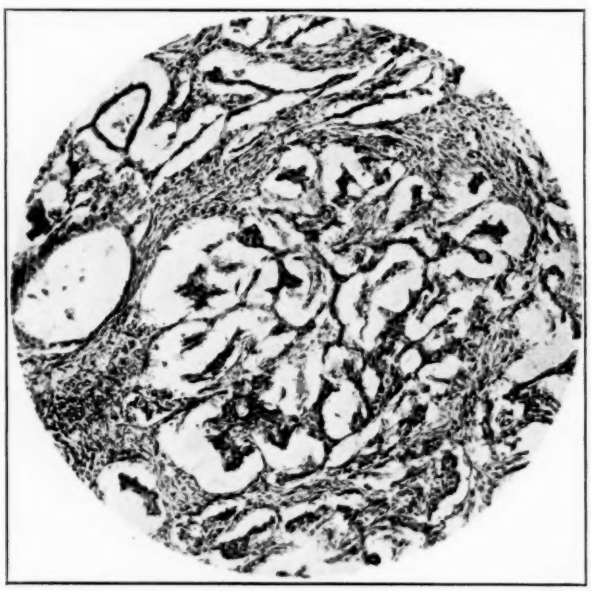


Fig. 3.—Microscopic section of tumor showing epidermoid cells.

On January 8, 1931, the patient's condition was greatly improved. She had gained 20 pounds, there were no signs in the chest and the wound was firmly healed. Vaginal examination revealed the cervical stump to be freely movable without pain and there were no masses felt in the fornices.

DISCUSSION

DR. SAMUEL A. WOLFE: A similar specimen was reported from the Greenpoint Hospital about two years ago. The treatment in that case was simple salpingo-oophorectomy, and to date there are no evidences of local recurrence or systemic metastases.

The pathology of the teratoma is important, particularly from the standpoint of prognosis. Teratoma are bidermal or tridermal mixed tumors derived from the supposed totipotent elements in the ovary, generally the ovum. The persistence of such elements after the menopause is rare and the occurrence of the tumor just

presented at this age is rather unusual. The prognosis depends upon the degree of differentiation of the derivatives of the constituent germ layers. Judging from the slides the prognosis is evidently good. The mesodermal connective tissue and cartilage are of the adult type, and the glandular elements are all matured. Ripening of the constituent cells indicates low growth potency. The possibility of local recurrence and systemic metastasis is rather unlikely.

Usually blastomatous degeneration of mesoderm is pronounced in teratoma. The constituent cells retain their embryonal growth capacity and, therefore, rapidly proliferate, extend beyond the organ of origin and spread by the blood stream as sarcoma.

Department of Maternal Welfare

Conducted by Fred L. Adair, M.D., Chicago

STANDARDS OF PRENATAL CARE

Prenatal care means the medical and other supervision of the prospective mother during the entire pregnancy. It aims to safeguard the mother and fetus by avoiding, arresting, or curing diseases which may cause death or body impairment of both or either, and to bring women to labor in physical condition adequate to withstand any necessary strain. Prenatal care is necessary to put women in the best physical condition to endure the physical and nervous strain of parturition.

Prenatal care is absolutely necessary for a considerable number of women in order to avoid calamity. It is helpful to all and its value has been amply proved. While pregnancy is a physiologic process not all women who become pregnant are normal physiologically. Just as the draft board showed the physical defects of men between twenty-one and thirty called to the draft, the reports of infirmaries and gymnasiums of women's colleges are showing that a large percentage of young women are below par physically. Moreover, a woman may have kidneys impaired by scarlet fever or other streptococcal infections and exhibit no sign of such weakness until the strain of pregnancy is thrown upon them. Tuberculosis is common, and if present it increases temporarily or permanently the hazard of childbearing. A woman with an active or latent tuberculosis requires especial care when pregnant. Cardiac disease is relatively common and handicaps the prospective mother, especially during labor. This should be recognized early in, if not prior to, pregnancy. Women may become pregnant with unsuspected syphilis and gonorrhea. Moreover, the physically and mentally or morally unfit of both sexes may marry and beget children. While prenatal care does much good for all pregnant women, it is absolutely necessary for the types above described, and few women will be found who will admit of their own accord that they belong to any of the above named classifications. The borderline between health and disease is narrower than in the nonpregnant condition, with the result that in no field of medicine do we more frequently see women pass from apparent health into a pathologic state.

Complications of obstetric importance often exist which do not impair the health of the individual. One of the best examples of such conditions would be a contracted pelvis, which may in no way interfere with the health of the nonpregnant woman but becomes a menace to both mother and baby during parturition.

As soon as a woman suspects that she is pregnant, she should go to the physician for diagnosis so that she may be under medical supervision during the entire pregnancy. The physician at the time of the first visit should obtain a very careful history, make a complete physical examination, and record all facts in a permanent history.

History.—The *family history* should be carefully reviewed to ascertain if there has been tuberculosis, insanity, hemophilia, cardionephritis, or tumors in the patient's ancestors or collaterals. The type of labors among the women of her family should be studied and reviewed and all complications incidental to childbearing should be recorded. The occurrence of malformation, endocrinal disturbance, and familial tendencies should be discovered and noted with a view to determining their effect

on mother and offspring. Under the heading of *past history* the physician should set down the diseases the patient has had, the time when she had them, and whether there were complications that followed. Special care should be taken if she had scarlet fever, tonsillitis, rheumatism, chorea, sinus or antrum disease, or any other occeal infections that favor the development of cardiac or nephritic disease. The physician should tactfully ascertain if there has been the possibility of venereal infection. A separate heading should record any surgical operations, when they were performed, the name of the surgeon, and the hospital in which they were performed.

The *previous pregnancies*, labors, and puerperiums should be investigated from the standpoint of toxemia, hemorrhage, and infection, considering each pregnancy separately. One should record the duration and type of previous labors. Abortion or miscarriage should be listed under the date, the period of pregnancy, and the cause of miscarriage. In previous puerperiums one should discover how long the woman was confined to bed, and whether or not there was fever. One should ascertain the birth weight of the previous children, and their health subsequent to delivery. If any children have died, their age at and cause of death should be recorded. *Present pregnancy.* The expected date of confinement is estimated from the date and character of the last menstruation and checked by the time when nausea developed, quickening was felt and by the results of the physician's examination.

The attitude of the physician during history taking and especially during the making of the physical examination should be one of tact and such as to inspire confidence in his care, interest, ability and integrity. One should strive to protect innate modesty and keep in mind the physical and mental strain through which the woman is passing while undergoing an examination which is often the first and most intimate examination she has ever experienced. The woman should be protected from any unnecessary hurt or exposure by gentleness and proper protection by the use of sheets, etc.

Physical Examination.—A complete and thorough physical examination should be made and all facts noted and recorded. The record should show whether the individual appears normal for her age, whether she is fat and exhibits any evidence of glandular disturbances, or is abnormally thin. The description of the type of woman should be so carefully made that a stranger might be able to visualize the type of patient. The color of skin, type of hair, and any distinctive characteristic should be noted. The entire body is then examined, and special attention should be directed to the teeth and mouth, looking for evidence of infection and improper oral hygiene or previous disease. The nose should be inspected to see if there is proper breathing space. The thyroid is examined to find any abnormalities. Heart and lungs are then studied and findings are recorded. If soft murmurs are heard over the heart, the patient should be examined in both a sitting and recumbent position to see if the bruit is altered by the patient's position. Examination of heart after emotional strain is over is often advisable. The breasts are examined for the character of both the breast tissue and the nipples. The abdomen is carefully inspected and palpated and the findings noted. Vaginal examination should be made at the time of the first visit to determine the existence of a pregnancy, the position of the uterus, to discover any pelvic tumor, and to see if there is any venereal disease. Inspection of the cervix and vagina will determine the presence or absence of pathologic conditions. A smear should be made from any suspicious discharge. At this time it is well to determine the contour of the sacrum, the mobility of the coccyx, to see if the ischial spines are unduly prominent, and to outline roughly the shape of the bony pelvic wall. (External pelvimetry contributes to the knowledge of the type of pelvis, and may suggest the possibility of a contraction. The figures derived from mensuration are not so indicative of

pelvic deformity, when less than normal, as the failure to conform to the relationships one to another—i.e., 25-28-31-20 or 21 will be accepted as the normal—but, 25-28-29-20 would at once demand further scrutiny. Internal mensuration alone fixes pelvic size.) The pelvis is now measured, taking first the transverse diameter of the outlet of the pelvis, which, if small, should be checked by determining the anterior and posterior sagittals of the pelvis. This can be made readily with any one of a number of pelvimeters designed for the purpose. The length of the abdomen is measured from symphysis to ensiform to see if there is sufficient room for the fetus to be carried without undue strain upon the abdominal wall, diastasis thus causing lines in the skin. The external measurements of the pelvis are now taken, the intraspinous diameters, the intracrestals, the bitrochanteric, and the external conjugate of Baudelocque. While the patient lies upon her side, the back should be inspected to ascertain its type. The spine should be examined with the patient in erect position or sitting. Only in case of lameness is it needful to take the oblique diameters to prove an asymmetric pelvis unless suspicion is aroused during vaginal examination. The legs are then inspected to see if varicose veins are present. The skeletal structures are examined to see if there are any changes indicative of rachitis or other osseous disease. The armpits, neck, and groin are palpated to see if there are any enlarged glands. The patient is then weighed, her height is taken and recorded, and her feet are inspected to ascertain the condition of her plantar arches. A complete routine blood count should be taken on all patients. It is surprising the number of low blood readings that will be found if this is done as a routine. A Wassermann should be taken in each individual case, and if the result is doubtful, or positive, the test should be repeated in order to avoid the chance of a laboratory error. The patient should be instructed to void before the examination and the urine should be tested for specific gravity, acidity, and the presence of albumin, casts or sugar. If albumin is present, microscopic examination of the sediment is indicated as routine to determine the presence of casts, blood, or pus.

If a pregnancy is diagnosed, minute instruction should be given to the patient on the following points in the hygiene of pregnancy.

Diet.—There is no condition in womanhood in which the diet should be as sensible and well chosen as in pregnancy. Granting that the fetus is in effect a parasite that takes from the mother's blood only that which it needs for its development, it also follows that the pregnant woman who has sufficient and proper foodstuffs in her blood stream to supply the needs of the rapidly developing fetus will endure the strain of pregnancy with the minimum amount of damage to her body tissues. One should not assume that the patient eats sensibly just because she appears strong. One should remember that the majority of primiparae are quite young women and that youth is so strong that nature appears kind. The physician should give his patient a definite diet.

A pregnant woman needs a diet so varied that she will receive necessary amounts of proteins, fats, carbohydrates, and minerals such as iron, calcium, phosphorus, and the vitamins. It should be sufficient to build up her tissue to full strength, and accomplish this without a marked storage of body fat. A pregnant woman should have enough basic foodstuffs to keep the urine on the alkaline side, while at the same time the diet should contain enough acid foodstuffs to supply protein to replace that burned by the patient's activities. A distinction should be made between tissue and nontissue proteins. The former come from flesh of all kinds and the latter from cereals, etc. The tissue proteins are probably more harmful in certain conditions, as toxemias, which arise occasionally in the latter part of pregnancy. Proteins are found largely in lean meat, eggs, fish, milk and its products, wheat, vegetables, as peas and beans. A distinction should be made between

starches and sugars, and the indications for their use and disuse are not identical. Carbohydrates are found largely in milk, cereals, breads, potatoes, rice, honey, sugar, etc. Fats are obtained in cream, butter, oils, fat meats, cream, cheese, etc.

Minerals are the chief building material for bones and teeth and with meat are an important source of supply for iron to build hemoglobin. They keep the blood neutral, the skin, hair, and eyes in good condition, and increase resistance to disease. They are found largely in milk, certain vegetables, and fruits. The best food containing calcium is milk or skimmed milk products, but it is obtainable from beans, peas, cauliflower, spinach, and dandelion greens, etc., figs and oranges. Iron is obtainable from beef, liver, oysters and spinach, and less readily from eggs, potatoes, codfish, herring, tomatoes, peas, lettuce, dates, prunes, and strawberries. The vitamins are found in milk and its products, meat, eggs, whole wheat cereals, vegetables, fruits, and cod-liver oil.

With such a wide distribution of foodstuffs in various articles of diet, meals may be selected that are appetizing as well as wholesome.

There is no reason why a normal pregnant woman should not eat meat in moderation notwithstanding old superstitions to the contrary. Modern investigation has shown that much more harm is done by using much salt as seasoning, by eating highly spiced foods and articles known to be indigestible than from eating large quantities of meat. The inclusion of meat is needed earlier, but not so much later in pregnancy. An acid type food, however, requires much basic foodstuffs to keep the body alkaline.

Cutting down sugars, sweets, and fats during pregnancy is a sensible precaution as long as there is enough fat and carbohydrate in the diet to furnish necessary energy. Bulk to combat constipation as well as supply necessary food is best obtained from vegetables and fruits. The pregnant woman, depending upon her size, should eat daily one and a half to two pounds of vegetables, weighed before cooking.

Desserts should be of fruits and not pastry. The pregnant woman should eat a grapefruit, two oranges, or an apple or two a day. Apples and prunes are usually well tolerated and aid considerably in elimination. Stewed and baked fruits are often preferable.

A normal pregnant woman should drink a minimum of eight glasses of fluid each day throughout pregnancy. Coffee and tea, and alcohol and smoking are all undesirable during pregnancy and should be cut to the minimum.

Iodine is usually necessary for a successful pregnancy, but can be given safely as a routine only by eating sea foods. Iodized salts should not be taken without special study if there is an adenoma in the thyroid. The prescribing of iodine is not necessary in all sections of the country.

There is little evidence to show that the amount of food taken by the mother greatly influences the size of the child, or that babies of excessive weight are the result of heavy eating. In former times, diets have been advanced to limit the child's weight, but these carry no conviction. On the contrary, there is much to indicate that the size of the child is controlled in large part by the woman's ancestry, or by heredity, provided always that the patient has sufficient food to keep her in good condition. Observations made in Germany during the war, as well as much animal laboratory investigation, have shown that the weight of the offspring cannot be much influenced by the amount or character of the diet, except by a diet lacking certain vitamins. A sedentary life probably increases the weight of the child much more than does the type of food, provided always that the diet is balanced and sane. Milk is an invaluable food for pregnant women. Overeating sweets, pastries, etc., should be avoided.

Weight.—The gain permitted should be influenced by the weight at the beginning of the pregnancy. By the time the patient reaches term she has gained some twelve or more pounds solely by the growth of products of conception. In addition to the gain represented above, she normally stores nitrogen, glucose, fat and other foodstuffs for use during labor and lactation.

The total weight that may be gained is still a matter of discussion. Most writers agree that twenty-five pounds' increase above the weight before pregnancy is the maximum amount that is usually desirable. Yet more important than the total amount gained is the rate at which it is acquired. Sudden gains of five pounds in one month are more likely to portend metabolic disturbance than to suggest a favorable condition. Sudden increase of weight is often due to edema which may not quickly show in a stout woman. A regular gain of two or three pounds monthly is desirable. Pregnant women do not usually gain in weight during the last two or three weeks of pregnancy under normal conditions.

If the patient does not gain in weight during pregnancy there is likely to be some abnormal condition, since failure to gain means actual loss of the ten or twelve pounds represented by the products of conception. Excessive gain during pregnancy or failure to gain at all requires investigation. Athletes strive to attain the optimum weight by appropriate diet, exercise, and systematic training.

Exercise, Rest, and Bathing.—It is difficult to specify the exact amount of exercise, rest, and bathing that a patient should take. It is a safe rule to urge her to take all the outdoor exercise that she can without causing fatigue. Yet exercise in pregnancy should depend largely upon the habits of the individual. It may be as much of a mistake to urge a woman of sedentary habits to force herself to take exercise that causes fatigue as to restrict the athletic woman in the exercise to which she has been accustomed. If a woman is accustomed to playing golf, there is no reason why she should not do so to a limited extent at least for the first part of her pregnancy. If she is accustomed to swimming, the same rule holds, but stunts and diving should be avoided. Bathing in rough waters should be interdicted. While the ordinary woman may safely drive her automobile for short distances for marketing or for calls, automobiling as a sport should be forbidden. One of the frequent causes of abortion is long automobile and railroad journeys.

Easy gardening is a good form of exercise and diverts the mind, but must be done as an amusement and not as a duty. Yet the physician must remember that the woman should come to labor with well-developed legs and a muscular back, and keep ever in mind that in many ways his duties resemble those of an athletic trainer. The patient should be warned against lifting children or heavy objects, and advised not to assume positions of muscular strain while the hands are elevated above the head. She should be cautioned against hanging curtains, or riding with her hands in the strap of a street car for avoidance of abdominal strain.

In the early months of pregnancy, the ordinary patient is apt to fatigue easily. She cannot sleep too much. She should take daily naps. The formation of the siesta habit will help the pregnant woman get more quickly through the discomforts of the first months. Sleep is not essential to the daily rest, but the clothes should be loosened so that the patient may relax thoroughly. Even in the early months of pregnancy if she is going out in the evening she should take an afternoon nap. She should sleep in a well-ventilated room with the windows open to assure plenty of fresh air. Her sleep should be restful. This often proves difficult because she may be awakened by digestive disturbances, a desire to void, or in the later months of pregnancy because of difficulty in breathing. Sodium bicarbonate is helpful. A woman unaccustomed to sleeping on pillows may find in the later months of pregnancy that it is desirable to use even two or three.

The ordinary woman takes too many baths. Hot tubs daily are likely to be more productive of fatigue than comfort. Tepid baths with cold spongings may be taken frequently, but baths extremely hot or cold, Turkish or cabinet baths, hot sitz baths, and surf bathing are likely to invite disaster. During pregnancy the skin is said to secrete more than at other times. Sea salt baths often tone the skin but should not be taken if the patient feels exhausted. They often check the profuse sweating, which is an annoying symptom. Light massage, general except for the abdomen, is very helpful and soothing. In the last weeks of pregnancy tub baths should not be taken because of the chance of carrying polluted water into the vagina and favoring infection. Showers or sponges alone should be used. Vaginal douches should be forbidden unless indicated by disease. When given they should contain only mild antiseptics, given in tepid water and under low pressure. The top of the bag should never be more than twenty inches above the douche point. Vaginitis should be treated thoroughly to avoid the danger of puerperal infection. The douche bag and point, and all solutions employed should be boiled before using.

Bowels.—Constipation is common during pregnancy since the gravid, enlarged uterus is likely to interfere with normal peristalsis. A long standing habit of constipation cannot be cured in a short time. Drugs are necessary. The bulky vegetable diet often aids in securing bowel movements, especially if the patient attempts to develop an unfailing habit at a definite hour following a meal. Bran in bread and biscuits may be used but too much roughage may cause colicky intestinal pains. She should also take mineral oil or petrolagar in small doses daily after each meal. This habit should be maintained throughout pregnancy if the stomach remains settled. If this medication does not give successful results, she may use prunes, figs, or dates with senna, made according to formulas widely known among the laity. The use of strong catharties is inadvisable except for definitely indicated morbid conditions. The occasional use of cascara, pills with aloin, belladonna and strychnine, phenophthalein or mild salines ordinarily may be advisable. Yet if the individual persists with the use of petrolatum and uses medication only when the bowels have not moved, she may develop a regular habit during pregnancy. Enemas should be avoided, but if necessary, a small oil enema is the best.

Kidneys.—The kidneys probably are one of the most vulnerable tissues in the body during pregnancy, hence the urine should be examined frequently by the physician. The urine should be examined monthly for six months, every two weeks during the seventh and eighth months, and weekly during the last month of pregnancy, even in the absence of symptoms. The patient should send a four-ounce bottle of the first sample voided in the morning to the physician, and should measure once a week the 24-hour amount. If this does not exceed 1500 c.c. the patient should drink more water. Edema may necessitate changes in fluid intake.

Teeth.—There is an old saying "for every child a tooth," based largely upon the popular belief that the fetus takes calcium from the mother's teeth and bones. While this condition may hold true in very limited extent, there is little evidence for the belief that it does so as a rule. Teeth decay more often from an upset stomach which alters metabolism than because the child is withdrawing fixed calcium from the mother's bony tissue. Oral infection is often overlooked and should be investigated. The care of the teeth is most important during pregnancy and the technic of proper dental hygiene should be carefully explained. Teeth should be brushed from the gum toward the biting surfaces and with a hard short brush that has not been wet save with the dentifrice. The gums should be massaged with the brush to stimulate circulation in the tit-like processes which jut down between the teeth. Scouting of the teeth from side to side is harmful. The teeth should be brushed upon arising and when retiring, as well as after each meal. Saline washes

with lemon juice make a good substitute for tooth paste. The mouth should be rinsed with an alkaline wash several times a day.

Breasts.—The breasts should receive attention early so that the woman will have every chance to nurse her child. Massage is useful. The entire breast should be moved upon the chest wall, holding the mama firmly in the hand. This type of massage stimulates the circulation of the breast. It should be done daily. Small and underdeveloped nipples sometimes may be elongated by traction with the fingers or with a breast pump. Nipples that show signs of fissures may be softened with lanolin, cocoa butter, or mineral oil, a procedure which tends to make them more elastic. Other solutions are useless. The skin cannot be hardened with alcoholic preparations. Wooden or lead nipple shields sometimes help the development of small nipples. It is worthy of trial. The outlook is gloomy, however, for making retracted nipples serviceable by any known methods of treatment.

Intercourse During Pregnancy.—In healthy persons sexual intercourse does no harm as long as the abdominal enlargement is not great. It should be forbidden, however, in the last six weeks of pregnancy since it may cause puerperal infection. The patient should be made to understand the danger. If the patient has shown a tendency to abortion or premature labor, coitus should be interdicted. That nature wishes to discourage intercourse during pregnancy may be inferred from the fact that most women lose desire after the fourth or fifth month.

Maternal Impressions.—The laity believe that the child may be marked because of some terrifying sight seen by the expectant mother. There is no doubt that profound mental emotion occasionally causes abortion or premature labor. Yet there is no evidence that a child can be deformed because the mother has been frightened. In the first place there are no nerves passing between the mother and the child in the uterus, so there is no tract by which mental and nervous impressions may be conveyed. The only communication between the two lies in the interchange of materials of nutrition and excreta through the placenta. The mother's blood never enters the child and the two circulations are separate and distinct. Nature probably by thus erecting barriers between the mother and child has specially provided for the protection of the fetus from injury. If this were not true, many children would suffer because of mental emotions of the mother. Nine months is a long interval of time, one in which a patient can run the gamut of mental strain. Many physicians have seen hundreds of women who felt their child would be marked because of mental stress or fright they had endured, yet rarely have they seen a fetal injury which could be so explained. The child is completely formed at the end of the sixth week, at a time when pregnancy is not usually recognized. Most of the cases reported as maternal impressions have injuries that developed weeks before the fright occurred. Moreover, all monstrosities observed in the human being are found in lower orders of life and in much greater number. Yet the theory of maternal impressions has not generally been extended to apply to lower animals.

Preservation of the Figure.—The thoughtful physician will do all that he can to leave his patient unmarred physically by pregnancy or labor. More can be accomplished by prevention than by corrective exercises later. Yet at best the physician's opportunity is limited. He cannot prevent the collapse of the breasts that occurs after the woman has weaned her infant. Uplift brassieres, now fortunately in vogue, tend to keep breasts from sagging, but patients with large busts are apt to present themselves in their first pregnancies with breasts that have been held down by years of tight lacing. The massage of the whole breast and emollients may help in preventing the skin striae that show when a breast enlarges more. Corsets and proper support of the abdomen are often desirable.

The measurement of the length of the abdomen often is of value to the physician. If it is less than 30 cm. the skin is likely to break and present striae in the last weeks of pregnancy unless the head sinks in the pelvis early and prevents the uterine fundus from becoming markedly pendulant. Cold creams often soften the skin and make it more flexible, and proper maternity corsets aid in preventing undue extension. Yet the physician's opportunity for preventing an enlarged abdomen is somewhat limited. The uterus in the short abdomen is shoved forward because there is not enough room for the gravid uterus and intestines and because of the increased angle of the superior strait which is the rule with short abdomens.

Much can be done in keeping the patients from becoming obese. Far more can be done by prevention than in aiding her to reduce after she has become obese and abandoned nursing. An enlarged abdomen, however, is the rule in all short waisted women after parturition.

The legs should be routinely inspected to find varicose veins in their earliest stages. Elastic stockings worn throughout the day may prevent their developing.

Proper exercise, chiefly walking, tends to help the muscular tone and balance of the woman.

Clothing.—Fortunately women's clothing is now sensible and needs little adjustment during pregnancy because nearly all apparel hangs from the shoulders. Women with large breasts have in the past laced them down with tight brassieres. The proper treatment of such breasts is elsewhere outlined. Tight circular garters should not be worn. They retard the circulation of the veins and favor varicosities in case the venous musculature is not strong. Shoes, however, are not sensibly shaped. Spiked heels give inadequate support. The woman is likely to turn her ankle. Moreover, they elevate the heel unduly and tend to increase the sway of the back. Properly fitting shoes should have a broad heel support. The Cuban type of heel is as elevated as should be permitted. If a woman will wear flat heels, she should be encouraged to do so.

Routine follow-up during pregnancy and postpartum is a professional obligation. Patients should be seen and examined by their physicians at least once each month during the first five months unless they present complications, in which event they must be seen more frequently. They should be encouraged to report any condition that they do not understand. The patients should report for the same routine examination once every three weeks during the sixth and seventh months, once each two weeks during the eighth month, and once a week the last month. At each time the urine should be taken and examined. The blood pressure should be taken and recorded on each visit, and the patient weighed. Once a month she should have a hemoglobin reading of the blood. If the patient is anemic, a complete blood count should be done. In the eighth month of pregnancy, the pelvis should be again measured in the same manner as before, and at this time the diagonal conjugate should be taken and recorded. Abdominal examination is of great importance in determining the rate of uterine growth and the condition of the fetus. It should be done routinely at each visit. The development of the pregnancy is ascertained by abdominal palpation and by vaginal examination. Vaginal examination should not be made as a monthly routine unless indicated. During the last two to six weeks the fetal head should settle in the pelvis if the woman is primiparous and if the abdominal muscles are normal and the length is average. Breech presentations are not likely to engage. Women with abdominal measurement as long as 35 cm. frequently do not show engagement until immediately before labor. The reason for this is clear. There is abundant room for the entire fetus to be carried in the abdomen in such patients without causing strain upon the abdominal viscera. The upper pole of the uterus is displaced to the right side of the abdomen because the liver does not change shape, while the stomach is

constantly filling and emptying and is more likely to resent crowding. Women of short abdominal length carry the upper pole of the uterus far forward and have a pendulous abdomen. If the pelvis is normal there is no disproportion between the pelvis and fetus, the head will engage early. Each patient must have careful individual study during pregnancy. The physician should be able to recognize a disproportion before the onset of labor. If the head does not engage, he should see if it can be made to engage by pressing it down into the pelvis, at the same time seeing if there is any suggestion of overriding. It is a mistake in art to neglect the pelvic measurements and rely upon the test of labor to see if the child will come through. There are many reasons for failure of engagement besides absolute disproportion. If there is marked disproportion, the head will override the symphysis. Minor disproportions lead to difficulty when the head is jammed into the pelvis with the moulding, and it should be remembered that the head may enter the inlet and not emerge from a small outlet. Overriding is only one of the signs of disproportion and both its apparent presence and absence may be misinterpreted.

Minor Discomforts of Pregnancy.—There are a number of minor complications of which a woman will frequently complain. Treatment should relieve them.

Ptyalism occurs not infrequently and is often associated with nausea and vomiting. It is sometimes a very disagreeable and unpleasant symptom. The control is often difficult. Alkalies tend to inhibit salivary secretion.

Heartburn: Heartburn has of course nothing to do with the heart, but is occasioned by hyperacidity or fermentation. There are bitter eructations of clear fluid. It occurs most commonly in the last months of pregnancy and usually can be averted by taking a teaspoonful of bicarbonate of soda immediately after a meal. Milk of magnesia or brick of magnesia often works when soda fails. Avoiding acid drinks and rich or spiced foods does much to limit this discomfort. Usually there is some dietary indiscretion.

Fainting: Many women faint in pregnancy or lose consciousness for a moment. Usually they become pale, but not necessarily, and the pulse may or may not be affected. These spells usually follow indigestion and as a result they are not uncommon in the first months of pregnancy. Smelling salts or aromatic spirits of ammonia are proper stimulants.

Cramps: These appear in later pregnancy. They are due to muscle strain in Nature's effort to maintain the body balance as the center weight shifts forward because of the enlarged abdomen. In consequence there is continual muscle strain. Cramps usually come in the legs, and most often in the night. They may waken the patient. Massage gives relief. The fact that they are due to muscle strain suggests that the patient should wear proper shoes. If the physician follows the changes that the planes of the pelvis make during pregnancy the reason for cramps becomes perfectly clear.

Varicose Veins: These develop most often in the legs, but may come behind the knees or upon the thighs. They are seen in women who have poor musculature of the veins. The exciting cause is pressure in the abdomen. The appearance of varicose veins indicates a long train of trouble and discomfort. Treatment should be started as soon as the veins appear to be enlarged. Ordinary bandages usually do not relieve. It is a mark of wisdom to order an elastic woven bandage as soon as the veins first show. Elastic stockings may prevent varicosities from becoming disfiguring. The complaint cannot be controlled by elevating the feet. The veins do not completely disappear after a pregnancy. They are not infrequent on the vulva and may be very troublesome.

Hemorrhoids: Hemorrhoids are varicose veins in the rectum. While due frequently to increased abdominal pressure, they occur most often in women who are chronically constipated. When they bulge through the anus, they are likely to become strangulated and cause exquisite pain. Often they can be relieved by a cold water or witch hazel compress to the anus after the bowels move, held in position for five minutes while the patient is lying down. If the bowels are kept open, the condition may improve, but rectal suppositories are usually indicated before very long. Operations should be done only as a last resort.

Leucorrhea: Most women have leucorrhea in pregnancy; it represents seepage from the vagina. It is ordinarily pale yellow in color, and thin. It may cause irritation to the skin. Bathing with mild solutions of soda bicarbonate may help the itching. Bran baths are also a popular remedy, but if the leucorrhea is marked it may require douches and local treatment. Fortunately, however, this is necessary only at very rare occasions.

The patients should be given personal advice and printed directions for care during pregnancy. Pamphlets are much better for them than the books on maternal care which are likely to go much into detail concerning points the women might as well not know. Yet a proper list should warn the women about the early development of unfavorable conditions. The symptoms which should be listed as warning signals are as follows:

1. Marked nausea and vomiting.
2. Bleeding.
3. Continuing or recurrent headache.
4. Visual disturbances.
5. Dizziness.
6. Pain in the epigastrium.
7. Edema, especially of the face and hands.
8. Shortness of breath.

Nausea and Vomiting of Pregnancy: This complication, if taken early, is usually controlled by proper diet and elimination. Small and frequent feedings at two- to four-hour intervals usually cures the mild cases, especially if fluid is not taken with meals. The more liquid the food is, the more likely it is to be vomited. Water especially is not well borne. Water had best be given one hour after meals, while the patient is lying down, with a hot water bag at the pit of her stomach, or else by a retention enema of eight ounces two or three times a day. The bowels are regulated by the employment of mild laxatives. Anticacids frequently help, soda bicarbonate, magnesia, or citrocarbonate. Two types of diet are advanced, one rich in carbohydrate and the other in meat proteins. Both types of diet get results more by keeping food in the stomach than by virtue of the character of the food. In case the vomiting persists and comes on frequently, the patient should be sent to a hospital and treated according to one of the many recognized routines. Therapeutic abortion is rarely indicated and should not be done as a first resort. Bromide in starch water given by rectum aids greatly in the control of the disagreeable symptoms but should not be given to the patient to take without constant medical supervision.

Abortion and Premature Labor: A normal woman is not likely to abort if the implantation of the ovum is normal and firm. In the majority of early abortions, the fetus is pathologic. That spontaneous abortions are common, however, may be surmised because many authors have estimated that 10 per cent of pregnancies abort from other than instrumental causes. There is very little we can do as prophylaxis against underlying or predisposing causes of abortion. Complete rest is our main anchor. When a pregnant woman bleeds, she should be put to bed

and every effort made to keep her quiet. If pain follows the bleeding, there is very little chance of arresting the impending labor. Many patients who bleed, even in early pregnancy, have a low implantation of the placenta, some type of placenta previa. In the early months this does not constitute a formidable condition, but later in pregnancy it may be a serious threat to life. Consequently one should not examine a bleeding patient during the second half of pregnancy unless one is prepared to institute immediately any necessary obstetrical procedures to control the case. Vaginal examination, therefore, should not be made at home unless the physician is surgically clean, the patient properly prepared, adequate help present, and any instruments and equipment that might be used at hand. Misplacement of the uterus has been described as a common cause of abortion, a statement for which there is no proof. Women abort because implantation is faulty, because of actual trauma, or because the ovum is diseased. Women who in the past have aborted should be kept in bed for a week at the time when they would have been menstruating had pregnancy not occurred.

Toxemia: Persistent edema may give warning of a developing toxemia long before there is elevation of the blood pressure or changes readily recognized in the urine. The tissues of the body are more succulent in pregnancy than in the nonpregnant condition. There is always some edema present even though it does not show. This may be due to mild toxemia which accompanies every pregnancy, even in the absence of symptoms. Edema of the feet may be due in part to pressure of the fetus upon the large blood vessels, but nearly every woman complains that the fingers are swollen and stiff before she comes to delivery. Many women have some swelling of the face. When there is actual and recognizable toxemia, the blood pressure almost invariably is high, but the diastolic rate does not always rise as much as that of the systolic. The changes in the diastolic pressure are probably of greater significance than the more variable and less stable systolic pressure changes. These readings are a very important part of the reported prenatal examination of the prospective mothers. If a woman whose blood pressure during pregnancy has been 105 systolic reading reaches 130, there is a cause for treatment. Rest in bed for a week or more, increased elimination through bowels and kidneys, low protein, salt-free diet are proper therapeutic means. Sweating is useless. Blood chemistry observations give little aid. The urine usually shows a trace of albumin; casts appear later. With the appearance of casts, the presence of albumin, and a rise of systolic blood pressure above 150, the physician should carefully review the case and seriously discuss with himself the question of interruption of the pregnancy. The period of gestation is very important in reaching this decision. One would induce labor at or near term for lesser indications than at seven months.

Cardiac Disease: Women with diseased hearts rarely decompensate during pregnancy unless the heart has previously broken down. If they present such a history, they decompensate usually early in pregnancy if there are nausea and vomiting and other signs of toxemia; otherwise decompensation is delayed until the abdomen is crowded by the growing fetus. Rest in bed and cardiac tonics are urgently needed. Dyspnea occurs only in severe cases. Fortunately most women with cardiac lesions deliver without much difficulty. They rarely break down in the first stage of labor if they have not decompensated before. The child should be delivered as soon after dilatation of the cervix as the obstetric conditions permit. If cesarean section is indicated, which is comparatively rare, it should be done under local anesthesia, and the tubes tied and cut, for which procedure the physician should receive a demand signed by both husband and wife to warrant his doing it.

Syphilis: Frequently the physician is greatly surprised when he receives a positive Wassermann reaction from the blood serum of a woman who appears absolutely normal. There is disagreement as to what should be done in such event unless the

reaction is well pronounced. While slightly positive Wassermann reactions may result from some metabolic disturbance in pregnancy, there is no doubt that a four-plus Wassermann indicates only syphilis. In case of doubt it is safer to treat for the disease than to omit this wise precaution. Intravenous injections of arsphenamine should be given for a course of twelve to twenty doses, followed by six weekly injections of mercury. If the Wassermann reaction then remains positive, which it occasionally does, the same course of treatments should be repeated after an interval of two weeks. One should be very cautious about the use of arsenical preparations late in pregnancy. Mercury and bismuth preparations are much safer. Such therapy does not cause miscarriages or premature labor, but tends to prevent or cure syphilis in the fetus. Before beginning injections, one should take the husband's Wassermann. Patients of this type must be most carefully and tactfully handled.

Tuberculosis, diabetes, goiter, and contracted pelvis must all be considered and investigated and carefully treated.

Abnormal Presentation: Abnormal presentations should occasion great concern. If the child lies in breech or transverse, it should be turned to vertex by external version whenever possible, even though it may prove impossible to maintain the converted position. A fetal head that is overriding the pelvis is a serious condition. The pelvic measurements should be checked and attempt made to force engagement before a cesarean section is done. If the abdomen is large, twins should be excluded. And when amniotic fluid is developing rapidly, one should entertain a suspicion that the child may be deformed. Roentgen ray in these cases occasionally gives a diagnosis. The thoughtful physician will protect himself by warning the father that there may be trouble with the child.

Multiple pregnancy, abnormal presentation, and monstrosities can be diagnosed by x-ray and should be carefully investigated as possible complications. X-ray probably may do more injury early in pregnancy than later. The amount used for taking pictures should not be harmful unless used excessively.

The physician must keep in mind that a pregnant woman needs routine care. The desire for such care is evidenced by agitation in all women's clubs throughout the country and the passage of laws displeasing to at least a considerable percentage of medical men. If a physician accepts pregnancy cases, he must accept the entire responsibility. If the patients are not able to recompense him sufficiently for the many necessary services, they should be directed to other sources where they may have the care that every pregnant woman needs.

Prenatal care is in line with the propaganda for periodic health examination, both of which stress the necessity for proper follow-up of the case with intelligent supervision.

It should be stressed that proper prenatal, intranatal, and postnatal care go together and each makes up a part of an integral whole.

Department of Book Reviews

CONDUCTED BY ROBERT T. FRANK, M.D., NEW YORK

REVIEW OF NEW BOOKS

For years Dr. Willy Meyer has made an extensive study of the literature on cancer as a result of which he adopted the tenets of the non-specific theory of cancer. Most of the first part of this book[1] on the origin, the development, and the self-perpetuation of cancer has already been published as papers in various journals and this material has here been expanded to take care of recent work. To all chapters is appended a significant bibliography. Dr. Meyer discusses at length the subject of predisposition through systemic chronic irritation. From a biochemic standpoint he feels justified in insisting that a condition of alkalosis indicates a predisposition to cancer. To counteract this overbalancing effect of the salts of alkaline metals to those of alkaline earth, he has exhibited calcium as the antagonist of the sodium and potassium salts, or by other means has produced an acidosis. He considers further the effect on the dead cell, and the focal and systemic effects of solutions of dead cells, necrone solutions. He develops his conception of an imbalance of the nerves, endocrine glands, serum salts and the psyche, as constituting a systemic chronic irritation, deals with the part modern civilization, increasing age and heredity plays in predisposition. In the discussion of the self-perpetuation of cancer he regards the lungs and lymph system as reservoirs of cancer cells and treats of the part the lymphatics take in a glandular defense against metastasis.

Based on the premises which he has developed in the first part of the book to bring forth his concept of the cancer problem he elucidates in the second part his proposed therapy, the various means by which the etiologic factors may be reduced or eliminated. Aside from surgery and radiation which he does not discuss in a technical manner, he suggests that radical operation or palliative operation, raying, depending upon the stage of the condition met, should be followed in every instance by systemic treatment, consisting in most painstaking postoperative therapy and continued observation.

To this end Dr. Meyer feels that equally important as a removal of the tumor is the destruction of cancer cells enmeshed in the lymphatics. In order to accomplish this an acidosis must be produced or, at least, a lowering of the degree of alkalosis prevailing in the body fluids of the patient. He suggests the production of fever and cites cases beneficially affected by continued fever. As an agent to produce such continued fever he advocates the use of repeated injections of Coley's fluid. Cases are cited illustrating this point. It seems remarkable that Dr. Meyer uses Coley's fluid in treating cancer, basing his therapy on a non-specific theory while Coley himself, and others, Sir John Bland Sutton, for instance, adhere to the parasitic theory of cancer and use Coley's fluid as a therapeutic agent under an entirely dissimilar premise. A study of the hydrogen-ion concentration of the serum, Meyer states, has shown that if a relative acidosis of sufficient degree is produced to reduce the serum pH to the normal value a cure, quite definite, can sometimes be obtained. Further chapters on therapy describe various other methods of producing acidosis particularly with reference to calcium medication.

[1] *Cancer. The Therapy of Operable and Inoperable Cancer in the Light of a Systemic Conception of Malignancy.* By Willy Meyer. New York, 1931, Paul B. Hoeber, Inc.

Dr. Meyer's views are personal, they are the result of a long continued study of literature and persistent clinical observation of many cases for years. Whether or not his theories are agreeable to research workers in cancer, the fact remains that any influence in the fight against cancer, prophylaxis, or cure, must be considered in a broad sense as helpful.

—*Philip F. Williams.*

Dr. Reed presents the subject of *Operative Obstetrics on the Manikin.*[2] The evolutionary trend of obstetrics and the increasing hospitalization of maternity cases seems to be leading more and more toward operative interference in labor. If such is the case it is well to have the subject presented not only for the student but also for the general practitioner and junior group of specialists in such a clear and effective manner as it is here given. Pelvimetry, fetometry and the maneuvers of normal delivery precede an excellent discussion of forceps operations, breech extraction and version. Operations not possible on the manikin including the various types of cesarean section and the repair of injuries to pelvic structures at birth are considered in detail, while the operative treatment of various types of hemorrhage forms a separate chapter. The book closes with a set of standing orders for mother and child, and suggestions for maternity hospital interns which might well serve as an outline in any maternity. The illustrations, although for the most part from other works, are suitably chosen.

Although practically all the text appears here and there in the average standard book on obstetrics yet its compilation in a small easily handled volume serves to make the book much more useful for ready reference, and its presence in the obstetric satchel might be welcome in a time of need.

—*Philip F. Williams.*

Dr. Konikow feels that her personal experiences with 758 women whom she has advised as to "volitive eugenics" have been sufficiently valuable to warrant her in a presentation of this book.[3] She discusses all the methods available from various angles and gives her reasons for choosing the measures she considers most applicable for the average case. One pertinent bit of advice to physicians prescribing such methods is that they should explain to patients any possible reasons for partial or relative sterility which they may find during an examination. On her printed record form appears a space for "Reasons for Refusal to Give Contraceptive Advice"; it would have been interesting if Dr. Konikow had included even a small paragraph as to when and why she has refused any patient's request since, according to the long statistical tables she presents, no woman applying to her for contraceptive advice seemingly was refused. She gives a rather näive explanation for the attitude of the Catholic clergy toward the subject of limitation of offspring.

Of more interest than some other parts of the books are the sections devoted to the subject of temporary sterilization by the x ray, and to the work of Haberlandt with injections of ovarian and placental products for temporary sterilization of female animals. She refers also to the recent work of Naiditch in the Soviet Institute for Experimental Endocrinology. Naiditch finds that repeated injections of dead bull sperm have produced in women a sterility lasting from two to twelve months, the average dose being five billion sperm cells in ten cubic centimeters of diluting fluid.

For anyone who is not familiar with the methods of contraception, this book offers a full presentation of the subject.

—*Philip F. Williams.*

---

[2]*Operative Obstetrics on the Manikin.* By Charles B. Reed. Philadelphia, 1931, P. Blakiston's Son & Co., Inc.

[3]*Physicians' Manual of Birth Control.* By Antoinette F. Konikow. New York, 1931, Bushholz Publishing Company.

This final, deeply felt bit of writing[4] of a famous scientist leaves to posterity an unperishable part of himself. The practical philosophy of life, so simply and delightfully presented here, will keep alive for many of Warthin's former students the memory of a beloved teacher.

—*Philip F. Williams.*

Dr. Karl Abel offers a set of ten pocket size pamphlets on obstetrics and gynecology[5] for the general practitioner, based on lectures given in postgraduate courses. With their help the busy physician may quickly orient himself on any subject, and see what is practical of the new advances. Any individual pamphlet in the series may be purchased separately. The first pamphlet discusses Embryology and Anatomy. He develops constantly the practical relationship between anatomy and clinical practice; embryonal rests and the formations which may develop from them, innervation and application of local anesthesia; the medico-legal aspects of the difference between decidua and chorionic cells in questionable pregnancy; and the relationship of the ureters to the pelvic organs in disease and operation. The second pamphlet sets forth the Physiology of the Pelvic Organs. He believes sex education should be begun at home by the mother and that birth control and allied questions are in the province of the physician and individual patient. The third pamphlet discusses Gynecologic Examination and Changes in Menstruation. It is rather hard to agree with Abel, that the nonpregnant cervix may be dilated as easily as he describes, and that submucus fibroids and corpus carcinomas can be palpated and recognized digitally. The fourth pamphlet on Changes in Position, and Inflammations of the Uterus is a concise practical presentation of the current practice. The fifth pamphlet dealing with the Tumors of the Uterus briefly and clearly gives the high points of our present knowledge. Abel states that German operators are turning more to vaginal hysterectomy than to abdominal radical operation for carcinoma of the cervix and that roentgen-ray postoperative therapy is systematically used. The indications and technic for radium are detailed. The sixth pamphlet on Diseases of the Adnexa, and Appendicitis in Women reveals a remarkedly conservative attitude to the one and a radical attitude to the other. The seventh pamphlet, External Genitalia and Vagina, and Gonorrhea in Women is an excellent treatise of the subject. In discussing Abortion, the subject of the eighth pamphlet, Abel does not hold a brief for any social or eugenic indications for therapeutic abortion, a sound viewpoint when one considers the present furor in medical circles in Germany over the proposed revision of paragraph 218 of the penal code relating to abortions. In the ninth pamphlet, Pregnancy, Labor and Puerpurium are handled in a novel manner. Realizing the extraordinary difficulty in discussing such an enormous subject within such a small space, he has arranged the material as a lexicographer might. So alphabetically in either a line, a paragraph, or a section he carries one through the entire subject from *Abnabelung des Kindes* to *Zwillingsschwangerschaften* with trite, concise comments. In a similar manner he has handled the Therapeutics of Gynecology and Obstetrics in the tenth and final pamphlet. One is amazed at the number of proprietary preparations and biologicals suggested. There are numerous excellent formulas which are written out in the form of prescriptions with directions, also a list of the springs and baths of Germany.

There can be no doubt but that these booklets well fulfill their intended purposes.

—*Philip F. Williams.*

---

[4]*The Creed of a Biologist.* By Aldred Scott Warthin. New York, 1930, Paul B. Hoeber, Inc.

[5]*Gynäkologisch-Geburtshilfliche Taschenhefte für den Practischen Arzt.* By Karl Abel. [10]Hefte. Berlin, 1931, Otto Enslin.

The pupils of Paul Lecène, former surgeon to the Hospital Saint Louis, Paris, begin with this volume[6] a series of monographs, as memorials intended to perpetuate the clinical teaching of their chief who had such a work in preparation at the time of his death. This volume, *Generalities* by Pavie and *Lesions of the Breast* by Moulonguet forms the first of the *Anatomico-Clinical Diagnostics of Paul Lecène.*

Dr. Pavie discusses the relationship of the clinical surgeon to the clinical laboratory. He deals with serology, bacteriology and inoculation of animals, biopsy, recommending Bouin's fluid as the fixative in current use in the Hospital Saint Louis, and with gross and microscopic examination of tissue removed at operations. It is interesting to find that a photograph of the gross specimens as well as photomicrographs form a part of the patient's history in this institution.

Dr. Moulonguet gives a very thorough presentation of lesions of the breast. The Infections, under which he classifies galactocele as a chronic abscess, the Dystrophies, Hypertrophies, Engorgements, Cysts, the Neoplasms of the breast, benign and malignant. Of particular note is the section on Paget's disease, beautifully illustrated with many photomicrographs. The subject of cancer is discussed quite extensively from a clinical and anatomical standpoint. The author does not mention radium or x-ray in treatment, stating that surgical removal is the only efficacious method of handling cancer of the breast. Moulonguet mentions that Lecène in his long experience never encountered a case of syphilis or actinomycosis of the breast.

One may warmly recommend this monograph in anticipating the appearance of the future numbers.

—*Philip F. Williams.*

This book,[7] Ideal Marriage, its physiology and technic, is the first part of a *trilogy.* Van de Velde treats in it with the sex basis of married life and this volume will be followed by two others bearing on conjugal aversion, and sterility in marriage.

The book is divided into four parts. The first part deals with the general physiology of sex, with particular reference to the part certain stimuli, internal secretions, and external sensations, as perceived by the organs of sense, have to do with the origin and development of the sexual impulse. The second part deals with the anatomy of the male and female reproductive organs and with their general physiology and specific function as sex organs. The third part deals with the physiology and technic of sexual intercourse in a remarkably sane handling of a difficult topic. The fourth part deals with the Hygiene of Ideal Marriage, probably the most practical part of the book. The scientific character of the book and the author's treatment of the whole subject is in marked contrast to the manner in which many books on the same theme have been presented. There are many suggestions of a practical nature in the fourth part of the book which a physician could give to his patients providing the discussion of the marital relation reached a sufficiently wide latitude. Sex education has always been a difficult problem and sexual education is even more difficult because of the intimacy of the topic. However, to those to whom questions of this nature are presented this book may be of value.

—*Philip F. Williams.*

Embued with a contemplative philosophy regarding obstetrics, Doctor DeGaris has evolved a new definition of normal labor upon which his *Theory of Obstetrics*[8]

[6] *Les Diagnostics Anatomo-Cliniques.* By De Paul Lecéne I, Géneralites by P. Pavie, Lesions Du Sein by P. Moulonguet. Paris, 1930, Masson Et Cie.

[7] *Ideal Marriage, Its Psysiology and Technique.* By Dr. Th. H. Van de Velde. Translated by Stella Browne, Introduction by Dr. J. Johnston Abraham. Covici, Friede Publishers, New York, 1930.

[8] *The Theory of Obstetrics, A Functional Study of Childbearing.* By M. C. De Garis, M.D. William Wood and Company, New York, 1931.

is based. He discusses here the pathologic influences which interfere with normal labor and so oppose his theory. He analyses his own obstetric practice in the light of this theory with some interesting conclusions, makes a plea for more intensive case criticism, and suggests State research upon some important problems of maternity.

—*Philip F. Williams.*

This clearly written monograph[9] is much more comprehensive than its title, Hemorrhage and Leucorrhea, would indicate.

It is one of a series of small monographs on various subjects to bring to the practitioner the latest advances in science and practice. Runge has developed in a very thorough manner the current concept of menstruation, and its relationship to the glands of internal secretion. After considering the changes in menstrual bleeding the causes of bleeding from the uterovaginal tract, including such general conditions as blood dyscrasias, are taken up.

Of particular interest is the chapter on glandular cystic hyperplasia of the endometrium resulting from persistent graafian follicles (metropathia hemorrhagica). Here roentgen-ray castration as a therapeutic agent and its dosage are discussed, and reference is made to the difficulties of gauging a subcastration dose in young women where one may use radiation in preference to removal of the pelvic organs. Roentgen therapy has been found more effective when the exposure is given immediately after cessation of menstruation, because of the development of the follicle at that time. The illustrations in this chapter are particularly enlightening.

The author devotes a chapter to the practical usefulness of hormone preparations in the therapy of uterine hemorrhage, giving his results with anterior pituitary hormone, sex, or follicle, hormone, and the corpus luteum hormone. Here, again, he emphasizes the fact that our knowledge of endocrine therapy is still in a state of flux. He has obtained good results in the hemorrhages from hyperplasia of the endometrium with "Prähormon" giving 1000 rat units a day, either by suppositories or injections, and feels that they have ameliorated also several cases of "Puberty Bleeding" by this method. The sex, or follicle, hormone therapy is found of benefit in cases where muscular inability of the uterus exists or in infantile uteri associated with bleeding. He has exhibited 100 mouse units in the morning and 500 mouse units at night, the latter because the diminished excretion of urine at night results in a longer retention of the hormone in the body. He is not enthusiastic over the corpus luteum hormone, probably because of the unreliability of the available preparations.

The subject of Leucorrhea is taken up in considerable detail as to etiology, source and therapy. The presence of Monila is regarded as a secondary manifestation. He is particularly favorable to the use of lactic acid in the treatment of certain types of vaginitis.

The rather full development of the therapy of bleeding and leucorrhea, as well as the fact that the physiology is quite up-to-date, makes this excellent monograph of unusual value.

—*Philip F. Williams.*

The evident need for a small concise manual on prenatal care has resulted in a second edition of this excellent little book.[10] To complete its value as a maternity clinic manual a chapter on postnatal care has been included. The newer biologic tests of pregnancy and the British Maternity benefits are mentioned.

—*Philip F. Williams.*

---

[9] *Blutung und Fluor von Prof. Dr. Hans Runge, mit einen Vorwort von Prof. Dr. Robert Schröder.* Theoder Steinkopff, Dresden und Leipzig, 1931.

[10] *Ante-Natal Care* by Dr. W. F. T. Haultain and Dr. E. Chalmers Fahmy, with foreword by Professor R. W. Johnstone. Second Edition, William Wood and Company, New York; E & S Livingstone, Edinburgh, 1931.

Although statistical tables are usually tiresome there is a decided quickening of interest in obstetric results in a perusal of the current report, 1929, of the Glasgow Royal Maternity and Women's Hospital.[11] The method of classifying admissions is particularly enlightening on the influence of prenatal care upon maternal mortality; cases which received such supervision had a death rate of 0.9 per cent, emergency cases and cases which had not received any prenatal care at all had a collective mortality of 6.6 per cent. The maternal death rate for cesarean section was 4.7 per cent. There were 75 stillbirths among 210 breech presentations. It might be well for purpose of comparison of results if lying-in hospitals in America would adopt a standard scheme for their reports such as the one followed here, which was suggested by the Royal Society of Medicine for the unification of the clinical reports of maternity hospitals in Great Britain.

—Philip F. Williams.

This volume, *A Textbook of Surgery*,[12] edited by Dr. John Homans, represents the teaching of surgery in the Harvard Medical School. The material assembled from the lectures and other writings of a brilliant array of twenty-three surgical teachers has been edited to offer in a single volume the fundamentals of surgery, without stress on the technical side. It forms a splendid textbook of regional surgery for students and general practitioners. For the sake of completeness chapters on the ear, eye, nose and throat and on gynecology have been included. To many of the chapters a historical introduction which lends to the interest of the book has been included. In most sections a discussion of anatomy and physiology of the parts concerned brings added value to the presentation of the remaining material. The editing shows a most conservative attitude on the part of the compiler.

The section on gynecology is a clear and concise epitome of the present-day knowledge of that subject. Of necessity surgical treatment is but briefly discussed but the clinical manifestations have been fully gone into, the indications for operation or nonoperative measures presented in such a manner as to be most helpful to the general practitioner. With remarkable clarity and incisiveness an unusual amount of information on the female reproductive tract has been compressed in the twenty-six pages.

A bibliographic index of fifty pages follows the text. This lists by pages authors previously reviewed, the title of the article, and the journal reference, an aid to anyone wishing to do collateral reading or to search original literature.

The format is good, the book is printed on thin paper, and the illustrations, in many instances line drawings, simple in character, thoroughly correlate the text.

It is a splendid single volume textbook on surgery, well calculated to fit the needs of the student or the practitioner who wishes to review fundamental principles of surgery.

—Philip F. Williams.

The subject of *Abdomino-Pelvic Diagnosis in Women*[13] is offered in a volume so large that one wonders at first glance if the text may not be redundant, and further examination proves this to be the case. While Dr. Walscheid has been extraordinarily complete in his consideration covering practically every known gynecologic condition, one finds in many instances considerable repetition of the

[11] *Glasgow Royal Maternity and Women's Hospital*, Medical Report for the Year 1929. Prepared by J. N. Cruickshank, M.D., F.R.F.P.S. (Glas.), M.R.C.P. (Lond.). Aird and Coghill, Ltd., Glasgow, 1930.

[12] *A Textbook of Surgery*. By John Homans, M.D. Compiled from Lectures and Other Writings of Members of the Surgical Department of the Harvard Medical School. With a Special Bibliographic Index and with Illustrations by Willard C. Shepherd. Charles C. Thomas, Publisher, Springfield, Ill., Baltimore, Md., 1931.

[13] *Abdomino-Pelvic Diagnosis in Women*. By Arthur John Walscheid. St. Louis, 1931, The C. V. Mosby Company.

same idea. Dr. Walscheid devotes an unusual amount of space not only in the introductory chapters but elsewhere in the book to the relationship of body type to gynecologic disease; evidently his ideas are much influenced by Jayles' writings on anthropology.

In addition to presenting voluminously the lesions of the pelvis the author has included chapters devoted to diseases of those parts of other systems located in or near the pelvis, the abdominal wall and viscera, and of the anus and rectum. As a slight example of the disproportion in treating of various subjects it may be mentioned that elephantiasis vulvae occupies five pages with four illustrations, while ureteral lesions receive but a scant page. Although endometriosis is well worked up, the name of Sampson appears but incidentally, and while the Aschheim-Zondek test is mentioned as a general diagnostic procedure, the author fails to refer to its specific application later in chorioepithelioma. In spite of these minor criticisms the completeness of the subjects and the thoroughness with which they are covered renders the volume excellent for collateral reading.

—*Philip F. Williams.*

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Collective Review

A REVIEW OF THE GYNECOLOGIC LITERATURE OF 1930

BY SYDNEY S. SCHOCHET, M.D., AND JULIUS E. LACKNER, M.D.,
CHICAGO, ILL.
(From the Division of Obstetrics and Gynecology, Michael Reese Hospital)

(Continued from August issue)

MENSTRUAL DISORDERS

Views on the physiology of menstruation are constantly changing. According to Novak[100] there is evidence that forces us to question seriously the indispensability of ovulation to menstruation. We must abandon the theory that the life of the germ cell per se is the dominating influence in the cycle and that it determines the periodicity. Corner and Hartman[101] have described numerous operations on the menstruating monkey in which there was no evidence of preceding ovulation, although there were normal menstrual cycles. Hartman[102] found that the monkey menstruates but does not ovulate during the summer months. Apparently the ovum is not the underlying factor in menstruation. The follicle and the corpus luteum are important in the mechanism of menstruation but are not to be looked upon as the causes of menstruation. Hartman[103] feels that the causative factors of menstruation are outside of the ovary though cooperating with this organ in the maintenance of the menstrual rhythm. Novak[102] says that the ovarian secretion has a dual rôle; that of the follicle, and that of the corpus luteum. In the human cycle, the follicle is responsible for the early, slow, hypertrophic changes in the endometrium up to the beginning of the secretory phase; and the premenstrual phase is associated with the development and maturation of the corpus luteum. Corner[102] has established the existence of a specific corpus luteum hormone. The pituitary, by the probable periodicity of its own function, may be the regulator of the menstrual rhythm. Zondek and Aschheim[102] designate it the motor of the ovary. The action of the pituitary is indirect through the ovary.

Evans and Simpson[102] have been able to demonstrate two distinct hormones of the anterior pituitary, a growth substance, and a maturity provoking hormone. In summarizing the influences of the anterior lobe of the pituitary gland on the ovary, Cannon[104] says that the alpha hormone of the pituitary gland stimulates the ripening of the follicle which leads to ovulation. It also activates the estrus-

producing hormone responsible for the gradual development of the endometrium, characteristic of the interval phase. The beta hormone of the anterior pituitary gland stimulates the luteinic hormone of the corpus luteum. The estrus-producing hormone and the luteinic hormone combined, produce the series of changes which constitute the premenstrual cycle. Menstruation is undoubtedly the withdrawal of hormone support of the corpus luteum. The periodicity of the human menstrual cycle does not depend on the ovum but is due to the harmonious adjustment of many ductless glands. (From these brilliant research investigations and in spite of the epochal advances in recent years, it is evident that the final chapter in the perplexing problems of menstruation has not been written.)

In the consideration of menstrual abnormalities, we are impressed by the important rôle the hormones play as causative factors. Corner and Allen[105] have demonstrated that the corpus luteum produces a substance as important as the follicular hormone in the menstrual cycle. The pituitary hormones have no direct effect on the genital mucosa but exert their effect primarily on the ovaries. The follicle substance produces a direct estrus effect on the genital mucous membrane in both the castrated and noncastrated animals. All of the ductless glands are intimately concerned with reproduction. According to Riddle[105] this interrelationship makes the interpretation of menstrual disorders most difficult. Amenorrhea, in many instances, is a purely functional pituitary deficiency. Production of menstruation requires the hormones both of follicle and corpus luteum, as well as the hormones of the anterior pituitary gland. The cure of amenorrhea will be brought about by the hormones that activate the triangular mechanism of ovary, uterus, and hypophysis.

Novak suggests, on theoretical grounds, that the active principle of the corpus luteum isolated by Corner and Allen,[105] in combination with the follicle hormone, should mimic the normal menstruation. Anterior pituitary therapy has not fulfilled clinical expectations. Novak[105] thinks that thyroid extract remains the sheet anchor in the treatment of amenorrhea. The endocrine treatment of dysmenorrhea must be viewed pessimistically. Novak agrees with Frank[105] that irradiation of the ovaries in the treatment of amenorrhea should be used with great caution for fear of destroying totally the apparatus in an already deficient ovary.

Functional menorrhagias at or near the menopause are caused by the persistence of graafian follicles and the absence of corpora lutea. The anterior pituitary also plays an important rôle. Johnstone[106] says that in menorrhagia there may be an excess of follicle hormone. This may be due to an overproduction of the growth factor from the anterior pituitary lobe. Novak suggests that, since there is an absence of corpora lutea in functional bleeding, the administration of the newly active principle of corpus luteum may give the desired clinical results.

According to Graves,[107] periodic dysfunctional bleeding is due to an unbalanced physiologic state of follicle and corpus luteum hormones. The bleeding from fibroids (with the exception of the adenomyomas, the pedunculated and degenerated submucous myomas) is dysfunctional in character and is identical both morphologically and physio-

logically with that of the normal uterus. (This is a new conception of bleeding due to fibroids.)

Shaw[108] describes four clinical groups of uterine hemorrhage, viz.: metropathia hemorrhagica, due to uterine and ovarian dysfunction; epimenorrheal group, in which ovarian rhythm is too frequent; hypomenorrheal group, in which there is an irregular ovulation; and metrorrhagia, in which the ovaries are overactive due to marked defectiveness of the corpus luteum. The influence of the anterior pituitary body must also be considered. (While this new classification is interesting, more proof is required.)

Paroli[109] believes that the beneficial action of diathermy of the thyroid gland in the metrorrhagias of puberty, associated with deficient function, is due to a stimulation of the thyroid. Maurozio[110] reports the treatment of metrorrhagias of puberty with intravenous injections of blood. Seventeen of the 21 cases were reported as cured. McDonald,[111] and Matlock[112] advise radium for functional bleeding before resorting to surgical procedures. Lawrence[113] believes that menstrual disorders in adolescent girls are caused by insufficiency of anterior pituitary hormone.

Whitehouse[114] has suggested that dysmenorrhea is due to difficulty in the disintegration of the superficial layers of the menstrual decidua. The transient exacerbations of pain are associated with the passing of abnormally large flakes of endometrium. The beta hormone of the corpus luteum produces the premenstrual changes. A disharmony in the mechanism might be responsible for the clinical phenomena of this action. (These views are at variance with the accepted teachings.)

Norman F. Miller[115] feels that menstrual discomfort can be relieved, to a great extent, by posture and more fundamental muscle tone. Cases of dysmenorrhea associated with interstitial thyrotoxicosis are often relieved by therapeutic measures.[116]

Martin[117] suggests the production of an artificial menopause with irradiation for the relief of menstrual headaches in women past forty. Keith[118] suggests a similar treatment.

Brown and Brews[119] report 50 cases of congenital retention of the menses; 41 patients had an obstructing membrane situated at the junction of the vulva and vagina, and the other 9 cases at different levels in the vagina.

Schlange,[120] in a study of gastric secretion, found that there were no appreciable changes during the menstrual period.

Jameson, Bristol, and Cavenaugh[121] analyzed the records of 363 tuberculous women and found that there was a premenstrual rise in temperature in 42.4 per cent and that the extent of the tuberculous process exerts no definite effect on frequency or elevation of the temperature.

According to Geist[122] there is a wide range of variability in the actual concept of the normal menstrual function.

Sakheim and Lehfeldt[123] report that in a large percentage of climacteric women there exists a lymphocytosis due to a thyrotoxicosis.

Meyers and King,[124] corroborating Hannan's[124] experiments, found that in certain women, at the menopause, there is a disturbance in the epinephrine reaction. This is suggestive of a hypersensitivity of the sympathetic nervous system at the menopause. Von Magyary[125] attributes the disturbance of the blood pressure during the menopause

to a loss of function of the ovaries. TeLinde[126] analyzing 179 cases of postmenopausal bleeding found that 60 per cent were due to malignancy.

UTERUS

In a review of a series of 683 cases of fibroids, Lynch[127] observes that the large fibroid develops and causes symptoms earlier. He finds that hemorrhage, rather than degeneration, is the chief symptom of most of the fibroids of the present day. Fibroids develop more often in women relatively sterile because of congenital causes. Polak[127] feels that fibroids have an endocrinal unbalance with maldevelopment. Malignant growth complicated 32 of Lynch's 683 cases. There is not a close relationship between fibroids and cardiomuscular degeneration. Lynch favors the surgical treatment of fibroids because it permits conservatism.

The movements of fibroids in or adjacent to the uterine canal are due to uterine contractions, similar to the action of uterine contractions on the fetus.[128]

In an interesting article on the secondary growth of submucous fibroids, Fink[129] shows that injury to the birth canal and close approximation of the tumor to the underlying tissue are the more important etiologic factors. Borochowitsch[130] cites a case of expulsion of a large fibromyoma with an abortion. The submucous myoma was the cause of the uterine contractions which induced the expulsion of the ovum. Turunen[131] reports two cases of myoma of the portio vaginalis. There are 112 cases reported in the literature. An unusually large fibromyoma of the uterus weighing 133 pounds was removed by Behrend.[132]

Cetroni[133] reports a case of red myoma of the uterus and says that when necrosis is total, symptoms are acute. When necrosis is central, symptoms are chronic. (This is a sarcomatous change in the myoma and not a degeneration.)

Scaglione[134] notes that fibroids rarely develop before puberty or after the menopause. There is an apparent relationship of fibroids to ovarian activity. Danforth[135] records a series of 233 cases and concludes that surgical procedures are more conservative than irradiation. The supravaginal hysterectomy is the operation of choice. Scheidt,[136] Davis, and Cuseck[137] also favor this type of treatment.

In reviewing the treatment in 30 cases of submucous fibroids, Fink[138] concludes that enucleation is contraindicated when there are other fibroids. In the climacteric patient deep enucleation of the submucous fibroid may cause perforation. Labhardt[139] says that 20 to 25 per cent of uterine myomas require no treatment. Irradiation is contraindicated in patients who have not reached the menopause and where malignant degeneration is present. He irradiated in 20 per cent and operated 80 per cent of 1,000 cases reported.

According to Wood[140] many uncomplicated fibromyomas are removed surgically which would better be treated with roentgen irradiation. The advantages of the x-ray are lack of surgical risks, simplicity of treatment, certainty of result, and low cost to the patient. In young patients, myomectomy is preferable as it permits future pregnancies. (Surgery appears to us to be the ideal method of treatment.)

Surgery is indicated in patients with concomitant ovarian disease

or inflammatory tubal complications. With a correct diagnosis and a choice of cases, Zweifel[141] has the best results with radiation. In young women and very nervous women, radiation is contraindicated.

Carcinoma of the cervical stump occurs in about 1 per cent of the cases. Total abdominal hysterectomy is the operation of choice when the cervix is the seat of pathologic lesions. According to Counsellor[142] this operation is also indicated when the history suggests the possibility of malignant changes in a fibromyoma. Solomons[143] performs a total hysterectomy in these cases. Kennedy[144] approximates all the cervical ligaments following a total hysterectomy, thus constructing a substantial diaphragm above the vagina with a narrowing of the culdesac.

Vaginal hysterectomy should not be attempted when the body of the uterus is too large or when there are marked abdominal complications.[145]

Samuel[146] recommends a vaginal corpus amputation for sterilization in active tuberculosis or in mitral lesions complicating the pregnancy. (We prefer tubal sterilization.)

Micholitsch[147] explores the uterine cavity abdominally to diagnose possible uterine perforations. Strassman[148] describes a very interesting case of obliteration of the uterine cavity with amenorrhea due to a former uterine rupture and vigorous curettements. He brought the right tube down through an artificial uterine cavity and anchored it at the internal os. The operation was followed by normal menstrual periods after an amenorrhea of three years. (Since tubal mucosa does not menstruate, we cannot understand the rationale of this operation.)

Uncontrollable hemorrhage occasionally follows vaginal and abdominal extirpation of the uterus. Logothetopulos, according to Küstner,[149] packs the pelvis abdominally or vaginally in these cases, with a gauze bag in which eight to ten meters of gauze are placed to control the hemorrhage. The pack in each instance is removed vaginally.

Audrey[150] insists that serious joint involvement of women suffering from gonorrhea necessitates curettement of the uterus. (We object to this type of therapeusis.)

Stein and Torek[151] report a case of adenocanthoma of the uterus. The metastases were in the lung and mediastinum. Another interesting case of papilloma of the endometrium is described by Dafoe.[152] Only two other cases of this type have been reported in the literature.

Another rare case of true cavernous hemangiomas of the uterine wall without fibromyomas is cited by Horgan.[153] This is the fifth case recorded in literature. Lewinski[154] describes a case of lymphogranuloma involving the uterus and bladder.

Kimura[155] describes a case of cancer of the cervix complicated by multiple uterine fibroids, a cyst of the right ovary, bilateral parovarian cysts, and salpingitis. He reviews combinations of two, three, or four types of tumors of the uterus. Tommaselli[156] cites a case of abscess of the uterus containing 5 liters of pus, due to suppuration of a pedunculated fibroid. In 938 myomas and polyps, Glas[157] found 11 myolipomas and one lipoma.

Szathmary[158] reviewed 500 cases of chorionepithelioma; 47 per cent after hydatid mole; 26.6 per cent after abortions; 19.8 per cent after normal delivery; and 6.6 per cent after extrauterine pregnancy. Of the 500 cases 373 were operated. The mortality was 50 per cent. The

author advises prophylactic x-ray treatment in all cases of hydatid mole. (We suggest that the Zondek-Aschheim test be made every six or eight weeks to detect early malignant changes.)

Sturgis[159] believes that hydatid mole occurs more frequently than recorded. Delay in recognition and treatment increases the primary operative mortality. In his report on hydatid mole, Watkins[160] says that radical surgery is not justified until symptoms of malignancy develop. (Again we suggest the Zondek-Aschheim test as a check up in these cases.)

Schmitz[161] advises microscopic examination of all tissues expelled during an abortion, full-term labor, or accompanying a mole, to exclude diseases or newgrowths of the chorion. (An excellent suggestion.)

Holman and Mathieu[162] report a case of membranous cervicitis due to corynebacterium Hoffmanni, the first to be reported in the literature. Young[163] believes that chronic infection of the cervix is the most common gynecologic cause of pain in the lower abdomen and pelvis. He advocates cauterization of the cervix in these cases.

Bishop[164] cites a case of tuberculosis of the cervix. Primary tuberculous infection of the cervix is exceedingly infrequent; less than 25 cases have been reported. More often, tuberculosis of the cervix is secondary to other foci in the body.

Puente[165] reviews the cases of syphilis of the cervix over a period of ten years at the Rivadavia Hospital in Buenos Aires. He believes that syphilitic lesions of the cervix would be diagnosed more often if more thorough and frequent examinations were made.

Matters[166] treats gonorrheal endocervicitis with diathermy every third day, and injects a 3 per cent solution of mercurochrome into the subendocervical tissues at several points of the periphery. Baker and Miles[167] advocate cauterization of the cervix with a cautery that only chars a very superficial portion of the endocervix, thus avoiding carbonization of tissues with subsequent primary and secondary hemorrhages. Tovey[168] recommends copper ionization in the treatment of cervicitis. Copper ionization causes chemical infiltration, coagulation, and dehydration. Copper salts are carried deep into the tissues. There is no parallel between cauterization and ionization. (We have many unsatisfactory results with local treatments for endocervicitis.)

Fraenkel[169] advises the use of the Sturmdorf cervical excision in cases of endocervicitis and urges its more frequent use in Germany.

In cases of leucoplakia of the portio vaginalis, Haselhorst[170] advocates constant and repeated examination and biopsy.

Von Mikulicz-Radecki[171, 172] has demonstrated a sarcoma of the uterus with a hysteroscope which proves the value of the latter in the diagnosis of intrauterine lesions. He says one can differentiate a polyp of the corpus uteri from a submucous myoma by this method. Sigwart[173] contradicts this statement. (We had the privilege of seeing Professor von Mikulicz-Radecki demonstrate the use of his hysteroscope at the Michael Reese Hospital. We frankly confess that we did not appreciate the great value of this excellent procedure previous to this clinical demonstration.)

Schultze,[174] in a study of the nonpregnant uterus with x-ray, says one can determine the muscle tone of the uterus by that method. Decreased tone at the time of the menses is indicated by the rounded

outline of the uterus. Increased tone is shown by a distinct outline of the cornua of the uterus. The uterus contracts throughout, or in local circumscribed areas.

Devlet-Kildeevaand Raikhstein[175] found that sterility, abortions, and premature labors were common among women working in the lead industries. In a series of experiments on the isolated uterus in nulliparous, multiparous, and pregnant cats, they found that lead caused a hypertonic condition of the uterus.

Bickenbach[176] reports a case of hemorrhagic necrosis of the uterus and adnexa due to intrauterine injection of powdered soap. The necrosis was caused by the sodium hydrate.

Among the reports of rarer conditions are: a case recorded by Shaw[177] of sacculation of the uterus due to a weakness in the uterine wall at the site of fusion of the müllerian ducts; and a case described by Blair Bell[178] of inversion of the uterus due to a necrotic fibromyomatous polyp.

MALPOSITIONS

Royston[179] reports 69 operations on 62 patients with complete perineal laceration. The best results were obtained in those cases in which fine and easily absorbable catgut with few knots was used. The desirable time for defecation is twelve to fifteen days after operation. No enemas or rectal tubes should be employed. In primary repairs, continuous, fine, plain catgut is sufficient. (Experience teaches us that secondary repairs require a heavier and more durable suture.)

Farrar[180] reports 12 cases of repair of high laceration of the rectum by the modified Warren-Apron technic, with a cure in ten cases.

Liepman[181] finds among 325 retroflexions that six cases in this series were congenital. He compares congenital retroflexion in the female to kryptorchismus in the male; both conditions are due to failure in development.

John Cooke Hirst[182] reports 225 operations in which the round ligaments were overlapped in the midline as suspension operations for retroflexion. He recommends this type of operation with the correction of associated pelvic lacerations when the therapeutic test with a retroplacement uterine pessary has been unsuccessful. There were two primary failures. Successful pregnancies with no dystocias in labor were frequent.

Abell[183] describes a technic of ventrofixation of the uterus in the presence of complete procidentia in women past the menopause. He makes the uterus an integral part of the abdominal wall and fixes it to the fascia. The suturing and anchorage are extraperitoneal.

Julich[184] has obtained the most satisfactory results in correcting retroflexion of the uterus by Werth's modification of the Olshausen technic. Werth makes a vesicle ruff in suturing the plica vesicouterine to the uterus between the attachments of the round ligament. Bladder symptoms do not develop during pregnancy since only the peritoneal covering of the bladder, and not the bladder per se, is anchored to the uterus.

Counseller and Stacey[185] report the results of prolapse operations. The check-up was made two years subsequent to the operation. Of the 819 cases, 106 occurred in women in the childbearing period; 713 patients were past the menopause. There were 16 deaths, a mor-

tality of 1.62 per cent. Satisfactory results occurred in 95.97 per cent. The modified Gilliam technic combined with a vaginal plastic was the operation of choice for ventral suspension. This operation gave 88.7 per cent of satisfactory results. The Kocher operation for prolapse of the cervical stump was satisfactory in 94.87 per cent. The Watkins-Wertheim interposition operation was used in cases of normal sized uterus with a mild degree of prolapse and a large cystocele in the menopause; 96.61 per cent were successful. The Mayo vaginal hysterectomy was performed in 81 per cent of the cases past the menopause with large cystoceles and marked degrees of prolapse. The results were satisfactory in 97.22 per cent. Crossen[186] feels that an abdominal operation is required in prolapse only when there are other complicating conditions necessitating celiotomy. Vaginal hysterectomy is indicated when the uterus is pathologic.

Hurd[187] writes that surgeons at the Women's Hospital place little or no credence on the worth of round ligament operations nor of any intraabdominal procedures such as the various types of corpus fixation in the treatment of prolapse. Most cases can be handled by one of three methods, (1) the interposition operation, (2) the Alexandroff operation, or (3) vaginal hysterectomy. The latter is the best of the three methods. Fullerton and Faulkner[188] feel that the excellent primary and late results with vaginal hysterectomy in elderly women with marked prolapse make it the preferable operation in selected cases.

Payne[189] describes a technic for the repair of prolapse of the vagina following hysterectomy, with a report of four cases. Abdominally, he dissects the bladder, rectum, and broad ligaments from the vagina. Then introduces three silk purse sutures, forming an infolding mass of the upper end of the vagina. This acts as a plug for the outlet. The broad ligaments are then attached to this stump and the vesical peritoneum anchored posteriorly. A perineorrhaphy is performed. (In reviewing the various operations for prolapse, one is struck by the divergence of opinions among excellent men in regard to the most appropriate and most satisfactory type of operation.)

Sellheim[190] describes a condition "Hiatus vagina" in which inflammation of the vaginal walls has occurred during the puerperium, with a consequent formation of scar tissues which causes the vagina to gape. This is often accompanied by garrulitis vaginae. Hiatus vaginae decreases the libido.

MALIGNANCY

In spite of the intensive study of newgrowths in well-equipped laboratories throughout the world by investigators thoroughly trained in all of the related branches of science, no epochal progress has been made in the solution of this problem. Cancer takes annually a larger and larger toll of our adult population in spite of improved operative technic and advanced knowledge concerning malignancy. Possible cures still depend mostly upon early recognition of the disease. This aim of early diagnosis will be best accomplished, as stated by Grenough,[191] by the establishment of Cancer Clinics.

The etiology of malignancy remains a secret although we associate this type of abnormal cell multiplication with the type of cell multiplication (hyperplasia) occurring in various types of inflammatory

reactions. Bailey[192] presents a very careful analysis and study of the basic cause and nature of cervical cancer, and concludes that the intermediate causal factor is due to the rôle of bacterial action and inflammatory exudates upon epithelia. These recurrent attacks of specific intensity from the epithelial standpoint, involving epithelium during the danger period, result in the production of cancer. Bailey's studies appear to support the theory of Yamagiwa of Tokio that cancer may result from prolonged stimulation of cellular growths.[193] Working with more refined materials than Yamagiwa, Twort[194] has prepared an active carcinogenic tar from pinene. Spirito[195] was unable to produce uterine cancer with weak or strong doses of tar. The trend of cancer research is in support of the old views that cancer is usually the result of protracted stimulation of the growth of tissue by nonspecific agents.[193]

In an excellent exposition of the cancer problems, Kolischer[196] deplores the tenacious clinging to traditional concepts in the search for a single cause of malignancy. He believes that the aggregation of cells called a cancer is subject to the same biologic laws that govern the life of all other type of cells. Boerstrom[196] asserts that cancer is not the result of transformation of epithelial cells (highly differentiated cells never change their established characteristics) but is due to the transformation of the not specially differentiated cells of the reticulum around the capillaries. Mayo[197] asserts, that in the 10 per cent of people who have cancer, the cause or causes of cancer are due to varying degrees of immunity in the individuals.

The use of hormone extracts from the adrenal for the cure of cancer as reported by Drs. Coffey and Humber is not compatible with certain pathologic findings. Since cancer grows freely in the adrenal why hope to inhibit such growths by an extract[198] made by crude chemical processes which may alter more sensitive products? Cooke[199] has frequently observed the transition to malignancy in benign lesions of the uterine mucosa. (We admit our ignorance about these changes of benign lesions into malignancy for we have never found them in our studies.)

Among the recent cases of malignancy occurring in childhood and infancy are those of Morse[200] and Kohlhas.[201] The patient of Kohlhas was only sixteen months old.

The conception that tumor proteins differ in essential respects from those of normal tissues has not been confirmed by chemical methods; however, there is a difference in the distribution of proteins in the tumors from that in normal tissues. There is a higher content in nucleoproteins, less uncoagulable protein, and less globulin and albumin. Vaughan in his classical experiments on the guinea pig used both the water-soluble residue of cancer cells which was extracted with alkalized alcohol, and vaccine of tumor-cell emulsion. Both methods cause a lymphocytosis and in sensitized animals anaphylactic deaths. Longo[202] reports a leucopenia when his neoplastic vaccine prepared from human material was injected into women with malignant genital tumors. (A critical study of these two divergent reports indicates that the test per se is of no diagnostic value, but that the reactions are dependent on the amount of lymphocytic ferments present in the tumor vaccine.)

Only 40 cases of primary carcinoma of Bartholin's gland are record-

ed in the literature. Schneider[203] treated his cases by radical excision followed by deep x-ray therapy. Although there exist twelve different operative methods for the treatment of carcinoma of the vulva only 73 patients were reported free from recurrence for a period longer than five years. Stoeckel[204] advocates the Rupprecht radical operation followed by irradiation.

Pfleiderer[205] found that there was a decrease in cancer of the uterus in Germany during the years 1917 to 1924. He points out that Germany's food supply was greatly limited in the period during which the decrease in the incidence of cancer of the uterus was most pronounced, and therefore concludes that nutrition is of some significance in the pathogenesis of carcinoma. (Cancer of the body of the uterus is a disease especially of the well-to-do as compared to a marked preponderance of cervical cancers in the dispensary group.) Graves[206] is of the opinion that corpus cancer occurs more frequently than was observed in previous years.

In Welch's statistics on more than 3,000 malignant neoplasms cancer of the uterus presented 29.5 per cent of the total number of cases; the next in importance were malignant conditions of the stomach. Ginmaraes[207] in a lecture points out that stomach cancer now holds the first place. This change may be due to the increase of operative procedures for leucoplakia of the portio and vaginal mucosa.[208] (These divergent opinions are quoted to emphasize the chaotic condition that exists in the statistical medical literature.)

The increasing death rate from uterine carcinoma is due chiefly to a late diagnosis, and no small part of this responsibility can be attributed to the carelessness of the busy practitioner. Novak,[209] and Spirito[210] again emphasize the importance of biopsy for the early recognition of cervical cancer and strongly advocate that the pathologic examination be made by one skilled in the interpretation of pathologic pictures found in the cervix. (We are in accord with Dr. Novak that the pathologic diagnosis must not be entrusted to the general pathologist who is not always familiar with pseudomalignant conditions so frequently found in inflammatory lesions of the cervix.)

Katz[211] of Vienna reports that carcinoma of the cervix occurred in only 25 of the 82,825 obstetric cases delivered in his clinic. In cases where there is a coexisting malignancy and pregnancy, Kaplan[211] advocates the termination of the pregnancy followed by irradiation treatment. The author is of the opinion that abnormalities in children born of irradiated mothers may be due to other sources than the radiation therapy. These views are not borne out by the research studies of Murphy[21] and his coworkers. In the above type of cases, Tropea[212] prefers electrocoagulation before the use of radiation therapy. This author believes that before surgical procedures are undertaken the status of life of the fetus, and the operability of the carcinoma should be considered. (We take no issue with individuals who base their conclusions and convictions on their religious views.)

Since the publication of Polak's 256 cases of cervical stump carcinoma collected from the American literature, numerous papers have appeared on the best methods of prevention of the development of cancer in the cervical stump. Branscomb[213] records 16 cases of cervical stump carcinoma, and notes that the estimated frequency of this condition after hysterectomy is from 0.4 per cent to 0.8 per cent.

When these cases occur, radium therapy or the use of external roentgen rays from a distance (bombardment) is indicated.[214]

Since Orthmann's first description of primary carcinoma of the fallopian tube (1886), about 232 cases have been reported in the literature. Watkins and Wilson[215] find no characteristic physical signs or symptoms to aid us in making the diagnosis. In a large percentage of the cases (the diagnosis has been made only once before operation —Falk), the lesions were neither recognized nor suspected at the time of the operation. The prognosis is always grave and very few patients survive the fifth postoperative year. Anspach[216] believes that recovery of patients with primary cancer of the tube is less than 4 per cent with operation and x-ray. Holland[217] states that primary carcinomas of the tube are on the increase and records eight additional cases.

The old-time dictum of Virchow that an organ which is prone to primary cancer is rarely the seat of metastatic cancer is not borne out in actual experience. With this thought in mind, Tate[218] emphasizes the necessity of pelvic examinations of all patients with malignancy in remote organs. Robinson[219] does not concur with Conheim's theory of embryonal rests, but believes that primary ovarian cancers arise from epithelial elements of the fully formed sex gland. There is considerable support for this belief as Rokitansky found that certain carcinomas develop from lutein cells.

Sarcomas of the ovary are rare in children under the age of ten years. Jaisohn[220] found only 24 cases reported in the literature between the years 1888 and 1915. Sarcomas of the uterus in adults are not uncommon and according to Kelley, constitute 2 per cent of all uterine tumors or about 5 per cent of all malignant neoplasms. Phaneuf[221] found hemorrhage, pain, and serous discharge the three leading symptoms present in sarcomas of the cervix. Bércléré[222] advocates x-ray therapy for uterine sarcomas, not because of the cures, but on account of the absence of primary mortality and the longer period of amelioration of symptoms than obtained with surgical treatment.

Since Marchand's classical paper on hydatidiform mole and chorionepithelioma we have associated characteristic ovarian changes with these lesions. These generalizations no longer hold good in all cases of hydatidiform mole or chorionepitheliomas. In their critical study of chorionepitheliomas, Novak and Koff[223] have found that the anterior pituitary is the immediate cause of lutein hyperreaction observed in the ovaries of these cases. In one of their cases the pituitary presented a marked and persistent pregnancy reaction due to the presence of masses of trophoblastic tissues in the metastasis.

According to Mack and Catherwood[224] credit for observing the first positive reaction from urine of metastatic chorionepithelioma belongs to Robert Meyer and his assistant, Roessler.[225] Novak says that the Aschheim-Zondek[226] test bids fair to become a valuable adjunct to the diagnosis of early pregnancy. It has been found that the concentration of the anterior pituitary hormone in urine was several times greater in chorionepitheliomas than in normal pregnancies. Schultze-Rhonhof,[227] Ehrhardt,[228] Fahlbusch,[229] and Hanz and Gault[230] have found the Aschheim-Zondek test extremely sensitive and of real diagnostic value in these cases. If a previously positive Aschheim-Zondek

test in cases of chorionepitheliomas becomes negative, the prognosis is good, but if the test remains positive one must look for metastases.

A cross-section study of the methods of treatment of carcinoma of the cervix and uterus convinces one that there is no uniformity of opinion as to which method yields the best results. It is most difficult and almost impossible to ascertain the true final end-results from the mass of published statistics, all of which are more or less modified and influenced by varying local conditions. The methods of radiation therapy as employed by the various institutes and clinics are so completely at variance with one another that a fundamental comparison of the results obtained is impossible. This statement is concurred in by the radiologic division of the Cancer Commission of the League of Nations.[231]

Zweifel[231, 232] sums up the methods of the treatment for cancer of the cervix, namely: first, surgery, either vaginally or by celiotomy; second, irradiation; and third, surgery plus irradiation. Deaver[233] states that the present methods in the treatment of cancer are inadequate and that the solution lies in the chemical field. Begouin[234] analyzes his postoperative results (radical operation) of fifteen and twenty years and finds that the five-year period is a safe and sane criterion. Bonney[235] discusses the value of the Wertheim operation in carcinoma of the cervix. The results of 284 cases showed an operative mortality of 16.5 per cent; 107 patients had recurrences before the end of five years; and 110 were well at the end of five years. Bonney[235] emphasizes the fact that survival for five years after the operation cannot be considered an absolute proof of cure, since about 10 per cent of recurrences develop between the fifth and tenth year.

Heymen[236] of Stockholm in a study of 790 cervical cancers of which 25.5 per cent were operable gives a cure of 20.6 per cent with irradiation. In a second group of 5,806 cases of which 54.6 per cent were operable 19.1 per cent were cured by surgery. From these studies the author concludes that in cases of cancer of the cervix radiologic treatment is the method of choice. Healy and Cutler[237] evaluate radium treatment based on the histologic structure of the tumor cells. Intrauterine radiation was found to be the method of choice in the treatment of papillary adenoma malignum. The authors believe that cases of corpus carcinoma should be separated upon the basis of histologic structure and treatment instituted on the basis of pathologic and clinical types. D'Erchia[238] advocates ligation of the internal iliac arteries as an improvement in the Wertheim operation. Kahlman[239] noted an increase of neutrophiles and a decrease in lymphoid cells in cases treated with x-ray. Most observers have found that irradiation increases the virulence of the vaginal flora. Bonnano[240] studied 20 cases and found that radium therapy never causes local or general septic complications. Doney[241] cites an interesting case of acute appendicitis complicated by old inflammatory adhesions from a previous radiation. In cases of cancer of the vulva, Buben[242] favors radium as the method of choice.

There is a marked difference of opinion as to methods of irradiation. Miescher[243] employs moderate doses over a long period of time. Bowing[244] accepts radiation as the method of choice in cervical carcinomas. The author and his associates report 981 cases and emphasize the known absence of a primary mortality with this method.

Meigs and Parker[245] studied the action of radium therapy on the malignant cells by repeated biopsies. They found that there were two groups; in one there was an increase in mitotic figures on the third and fourth day, and in the other group there were no mitoses. In the first group all patients died at the end of thirteen months. Neil,[246] Pitts and Waterman,[247] Nebsky,[248] and Bowing and Fricke[249] conclude from their statistical studies that radiation is the method of choice for cancer of the cervix. (From this review of the methods of treatment we feel that they all are inadequate and that new methods of approach will arise from such careful studies. If we are true prophets, chemotherapy will replace the procedures of the present day.)

ENDOMETRIOSIS

Sampson[250] presents a comprehensive study of tubal stumps. He found misplaced müllerian mucosa in 112 of the 143 stumps examined. In 100 uteri with intact tubes, misplaced müllerian mucosa was present in 16 instances. In 50 uteri with intact tubes removed for sequelae of salpingitis (a well-recognized cause of endosalpingiosis) misplaced müllerian mucosa was discovered in 19 of the 100 uterine ends of tubes. Sampson concludes that endosalpingiosis usually arises from sprouts growing out from the traumatized mucosa of the tubal stump of postsalpingectomies. Rubin[251] has failed to observe any cases of endometriosis as a result of tubal insufflation. Uterotubal insufflation is not likely to produce endometrial displacements if the method is performed properly and if the mucosa is intact.

In studies of autotransplants of endometrium in the peritoneal cavity of rabbits, Molinengo[252] found that attachments of pieces of muscle did not prevent growth, nor hormonal action of the ovary have any appreciable influence on the fragments of endometrium. Coggi[253] reports cases of endometriomas in scars of celiotomies. Haselhorst and Otto[254] record 27 cases of postoperative endometriosis of the scar of the abdominal wall, but are not positive that the implantation theory holds true in isolated cases. Kane and Kimbrough[255] studied 118 cases of endometriosis and concluded that ablation of the ovarian function causes cessation of activity and progressive atrophy of the endometriomas.

ABORTION

In a discussion of therapeutic abortion, Sellheim[256] outlines the difficulties in determining the indications of the borderline cases. Even though the consultant may favor emptying the uterus, the mother should be given a choice at this time.

The nervous and psychic disturbances of pregnant women with suicidal tendencies are most serious problems. It is usually advisable to combine sterilization with therapeutic abortion in this group of cases. Naujoks[257] gives a detailed outline of the indications for therapeutic abortion.

Because of the possibility of the subsequent birth of a monster, it is questionable whether a threatened abortion should receive conservative treatment.[258]

Grann-Peterson[259] reports 1,146 cases of abortion with a mortality of 0.61 per cent. The morbidity and mortality were lower with earlier emptying of the uterus.

Louros and Schieyer[260] have shown in animal experiments that it is possible with intrauterine injections of charcoal to exert a favorable influence on the outcome of a streptococcal infection in one-third of the cases, by a heightening of the phagocytic activity of the reticuloendothelial system toward introduced bacteria. The charcoal acts as an adsorbent and as a vehicle for the bacteria. Nahmmacher[260, 261] recommends the intrauterine treatment of afebrile and febrile cases of abortion with charcoal as long as the infectious process is localized in the uterus. There is no danger connected with this treatment, its action is rapid, and it can be easily applied. Charcoal is especially indicated in febrile abortions. Beuthner,[262] in a series of experiments, found that the charcoal does not prevent bacterial invasion of the uterus but that the good clinical results were due to adsorptive properties of the charcoal.

Saunders, Lackner, and Schochet,[263] in a series of biologic experiments on the adsorption of drugs in physiologic salt solution, have found that activated charcoal will completely remove adrenalin, acetyl-choline, histamine, and other basic alkaloids. These authors reported clinical results with activated carbons.

EXTRAUTERINE PREGNANCY

In a study of 474 cases of ectopic pregnancy operated at the Mt. Sinai Hospital of New York, from 1912 to 1930, Urdan[264] points out the following interesting facts: Previous sterility plays no important rôle, while previous pelvic infections are of extreme significance from an etiologic standpoint. There is often a history of amenorrhea for five or six weeks followed by bleeding and pain. The amount of bleeding is less than in threatened abortion. He believes that healed abscess cavities and diverticuli are important causes of extrauterine pregnancy.

The associated lesions of ectopic corpus luteum and ruptured tubal pregnancy are described in a case report by Lash.[265] He says that only 20 cases have been reported in the literature.

In an analysis of 167 consecutive operations for extrauterine pregnancy, Behney[266] finds that the preoperative diagnosis was correct in 61.3 per cent of the cases. Syncope occurred in 24 per cent. In the discussion of this paper, Titus[266] points out the value of the sedimentation test in the differential diagnosis between unruptured or recently ruptured ectopic pregnancy, and an acute inflammatory process. Farrar[266] emphasizes the value of the daily leucocyte count in combination with the sedimentation test in the diagnosis of extrauterine pregnancy.

Tallaferro and Lastra[267] report a case of intraligamentous extrauterine pregnancy with an intraligamentous ovarian cyst. When an abdominal pregnancy has advanced to term, the hemostasis is more important than the removal of the placenta.

According to the experiences of Jeanneney and Rosset-Bressand[268] rupture of an extrauterine pregnancy is not always accompanied by acute pain and the classical symptoms. Noe[269] reports a case of ruptured extrauterine pregnancy without abdominal pain. There were no signs of hemoperitoneum and the uterus was of normal size with slight thickening of the left adnexa. (From our experiences we are

convinced that the classical textbook symptoms of ectopic pregnancy are many times absent.)

STERILITY

Of 438 women examined before the twelfth week of pregnancy, 14 per cent had a retroplaced uterus. Plass[270] believes this frequency of retrodisplacement in pregnancy is an argument against the idea that it is a common cause of sterility. Hunner and Wharton, Danforth and Galloway,[270] are of the same opinion. It is a known fact that in 40 per cent of women the uterus normally is in the retroverted position.

Rowe[271] studied the rôle of endocrine organs in the etiology of sterility and found that arranged in order of importance they are: ovaries, thyroid, and finally pituitary gland. Cases of sterility associated with amenorrhea are frequently due to a persistent corpus luteum. In these cases there appears to be an excessive or an uninterrupted secretion from the anterior lobe of the hypophysis (Rho II). Although sterility is frequently present in women with normal genitalia and menstrual function, yet there may be an unbalance in the secretion of the ductless glands. Too little pituitary and consequently too little corpus luteum hormone may make preparatory changes in the uterus inadequate for a fertilized ovum to properly imbed itself securely in the uterus.

With the exception of the cases of sterility due to the absence of mature gametes, sterility and early abortion may be assumed to result from the same disorders. Both may be due to inherent defects in the gametes per se, to incompatibility, or to an unfavorable environment surrounding the fertilized ovum.[272] It should be borne in mind that implantation of the ovum is associated with slight hemorrhage. When this bleeding is excessive it often causes absorption or abortion of the egg.

Amersbach[273] is of the opinion that frigidity plays an important rôle in the etiology of sterility.

Kurzok and Miller[274] believe that the head of the spermatozoön carries a lysin that dissolves the cervical mucus, thus enabling the sperms to enter the uterus. Moench[274] claims that vaginal acidity is of little importance as a causative factor in sterility. He has determined repeatedly that spermatozoa live for hours in 0.5 per cent lactic acid solution. Weil[274] has shown that beneficial effects on the spermatozoa are exerted only within narrow limits of alkalinity, and that a change of the hydrogen-ion concentration in either direction acts detrimentally. Therefore alkaline douches are of little value in the treatment of sterility. When the Hühner compatibility test is performed, the specimen is collected one hour after the intercourse. At that time, impregnators of the ovum will be beyond the cervix. Peham[274] denies sperm immunity from a serologic standpoint. Moench has not found a spermotoxic reaction of serum in sterile women.[274]

In a discussion of ovarian deficiency and sterility, Macomber[275] says that ovarian deficiency means a failure of reproduction due to failure of ovulation. The latter can be caused by anything which seriously impairs ovarian circulation. Of the acquired lesions causing sterility, infections of the fallopian tubes are the more important. Bell[276] feels that a better understanding of the physiologic derangements of metabolism and of dietetic factors in their relation to sterility will lead

to an improvement in the treatment. Frigyesi[277] has not been satisfied with the results from salpingostomy. He prefers the transplantation of the patent portions of the tubes into the uterine cavity. Sellheim[278] has, in numerous instances, had a successful therapeutic effect with tubal insufflation. Salpingostomy is the only course left when the tubes are closed. However, Sellheim's successful results with this operation are less than the 10 per cent reported in the literature. He does not favor radiation of the ovaries in treatment of sterility, for he believes that more harm than good can come from this procedure.

The present treatment of established genital hypoplasia is ineffectual. Meaker[279] reports gratifying results in early cases of hypoplasia when all depressive factors were eliminated. In a study of this important problem, Moench[280] emphasizes the importance of a careful examination of the sexual habits in the investigation of any case of impaired or absent fertility.

Moench[281] outlines a detailed description of his technic of staining and of examining the spermatozoa in a specimen of semen. Sperm abnormalities are more easily diagnosed in the stained than in the fresh specimen. He believes that absence of all motility in repeated, absolutely fresh and uncontaminated semen establishes the cause of a sterility.

Hill and Smith[282] analyzed 198 cases and found that obesity in women per se is not a cause of sterility. When the two conditions occur in an individual the sterility is usually due to hypothyroidism. Anspach[283] employs vitamin A diet and calcium lactate in the treatment of sterility. Reduction of the weight of the patient is also important. Obesity is frequently associated with impairment of ovarian function and ovulation. He reports no pregnancies after salpingostomy in his series, and concludes: "Until we understand the interrelationship and function of the ductless glands and have more accurate methods of estimating the excessive or deficient activity of each, we can scarcely hope for more favorable results. (We agree with him.)

TUBES

To determine the effect of a 40 per cent lipiodol injection on structures of the uterus, tubes, and peritoneum, Schroeder and Jacobi[284] examined 30 tubes, 26 endometrial scrapings, and 12 specimens of peritoneum. They conclude that lipiodol does not produce any histologic changes in these tissues. However, damages to the tissues have been reported. Lash[285] interprets his case, and the cases of Odenthal and Ries, as foreign body reactions to lipiodol. Villar[286] reports a tubal rupture following lipiodol injections. (The adverse reports may be due to faulty technic or failure to select the proper type of case. Lipiodol injections are safe in the absence of infections.)

According to Buckley and Mathieu[287] little or no bactericidal power can be ascribed to lipiodol or iodipin. Witwer, Cushman, and Leucutia[288] report 512 cases of hysterosalpingography with iodized oil with only a single accident. They feel that iodized oil is of therapeutic value in some cases. Novak[289] reports a case of foreign body peritonitis, due to the oil and concludes that tubal insufflation, under proper precaution, is less dangerous than salpingography. Curtis[290]

is of the opinion that the instillation of iodized oil is a valuable diagnostic measure but must be used with great caution. He has seen cases in which the peritoneal reactions were very severe. Watkins and Menne[291] studied the occlusions in the lumen of 49 tubes and noted that they were most common in the isthmic portion. Operations to reestablish the lumen should not be attempted until a definite diagnosis including site of the obstruction is made. Satisfactory surgical results are seldom obtained when the occlusion is in the intramural or isthmic portion of the tube. Lipiodol injections are contraindicated in pelvic infections. Von Mikulicz-Radecki[292] concludes that implantation of the tube in the uterus is alone successful when a portion of the pars isthmica is intact.

Rubin[293] accepts the diagnosis of tubal obstruction when three successive insufflation tests at 200 mm. are negative. Strictures are most often found at the uterine ostiae, the intramural and the distal part of the isthmus of the tubes. Whenever it is possible to correct a retroflexion, the repeated insufflations will determine a true obstruction or merely a tubal kink. Rubin states that strictures in the tubes can be localized with the kymograph. Permeable strictures cannot be determined by means of lipiodol unless a constant fluoroscopic examination is made and supported by repeated x-ray plates at stated intervals.

Denton and Dalldorf[294] report a foreign body type of inflammatory process in the tube, which simulates tuberculosis and has been frequently confused with it. Definite tuberculous granulation tissue was absent in this case and there was no clinical evidence of tuberculosis in other organs. The diagnosis of tuberculosis should always be confirmed by animal inoculations or the demonstration of the acid-fast bacilli in the sections. (This valuable paper is of special interest to the gynecologists in view of the numerous case reports of tuberculosis.) Holtz[295] reviewed 1262 cases of nontuberculous salpingo-ovaritis; 402 were gonorrheal; 102 septic; 10 representing a mixed infection of gonorrheal and septic; and 748 of unknown etiology. In 1.4 per cent of 290 cases in which the adnexa were removed, the condition appeared to be secondary to appendicitis. In 15.5 per cent it followed abortions or parturition. There is a frequent occurrence of violin string adhesions between the anterior surface of the liver and the anterior abdominal wall in gonorrheal disease of the tubes, according to the observations of Curtis.[296]

Mathieu[297] advises the Bell-Beuttner operation in cases of chronic gonorrhea of the tubes.

Aldridge,[298] in a review of 1066 cases of salpingitis says that the leucocytic count, temperature, and sedimentation tests should be normal before an operation for infection of the tubes is performed. (We do not believe that this teaching should be an inflexible rule.)

If reinfections can be avoided, Curtis[298] finds that only 15 per cent of gonorrheal infections will ultimately require surgical intervention. Priestley and Payne[299] studied the records of 98 patients with acute pelvic inflammatory disease, and found that 66 were cured; 10 required evacuation and drainage of tuboovarian or pelvic abscess; and 22 were operated during the subacute or chronic stages. The high operative incidence, 25 per cent, is explained by the fact that the majority of these cases were in poor financial circumstances and had

suffered from repeated exacerbations of the infection. Conservatism should be the rule. The ovary should be removed in its entirety or be allowed to remain undisturbed. Priestley and Payne are in favor of the maintenance of the menstrual cycle. Postoperative enlargement of the ovary occurred in 14 cases. Of the 14 cases, 3 complained of abnormal menstruation; 2 of severe pain due to the affected ovary which required subsequent operative removal.

Von Buben[300, 301] treated 142 cases of adnexal inflammation with diathermy; 49 were cured; 81 improved; and 12 showed no change. He feels that diathermy relieves pain and decreases the size of the inflammatory tumor. Royston, Ewerhardt, Roblee, and Zener[302] report increased mobility of the uterus in pelvic infection after four or more treatments with the Zener cervicovaginal electrode. (We have failed to see the brilliant results reported by others with diathermy.)

Little[303] reports his experience with turpentine injections in 75 cases of acutely inflamed tubes. After opening the abdomen he aspirated the tubes by means of a large syringe and injected a variable quantity of 10 per cent turpentine and oil (up to 70 c.c.). There was no attempt made to prevent the solution from exuding into the pelvic cavity. At the same time, an appendectomy, with ventral suspension by the Webster-Baldy, or Ohlshausen technic, was performed. One patient died; the body of the uterus and a large ovarian abscess had been removed; 90 per cent of the cases were permanently relieved of pain. In the vast majority of cases inflammatory masses disappeared within four to six months. (We question this procedure.)

Primary carcinoma of the fallopian tube was found in 0.02 per cent of all gynecologic admissions at Johns Hopkins Hospital, in 0.07 per cent of all gynecologic admissions at Lennox Hill Hospital, and in 0.31 per cent of all gynecologic laparotomies at the Leipzig clinic. About 200 authentic cases are reported in the literature. According to Watkins and Wilson[304] the preoperative diagnosis has been made only in one case. Retroperitoneal lymph gland metastases are common. The prognosis of primary carcinoma of the tube is almost hopeless.

Ahlstrom[305] reports actinomycosis of the left tube and ovary and cites 61 other cases in the literature. Infection is usually carried to the genitalia from the intestinal tract. The prognosis is bad.

Jameson[306] finds that tuberculous pelvic disease occurs in about 8 per cent of women with pulmonary tuberculosis. The roentgen rays seem to offer a feasible conservative method of treating tuberculous lesions of the uterus and adnexa. (Pneumoperitoneum with oxygen is an excellent method of treatment.)

Curtis[307] found 17 instances of tuberculosis in 200 tubes examined. Calcareous deposits, pallor of the lesions, peculiar rigidity of the adhesions and the open fimbriae of the tubes (in about 50 per cent) are the striking characteristics of tuberculosis of the female pelvis. Von Jaschke[308] advises conservative therapy, artificial heliotherapy, and protein stimulation in the treatment of pelvic tuberculosis. Roentgen irradiation up to 15 per cent of the skin unit doses is also of some value.

Frank[309] reports a rare case of subperitoneal cavernous hemangioma of the pelvic connective tissue which is the first recorded in the literature. This growth was partially removed at a previous operation.

The patient has had two subsequent operations followed by irradiation treatment. Bride[310] cites a case of hydatid cysts of the broad ligament. Einaudi[311] reports two cases of tumors of the round ligament, one a fibromyoma, the other a dermoid cyst. A fibroma of the labium majus arising from the extrainguinal portion of the round ligament is described by Barbanti-Silva.[312]

Five cases of torsion of normal tubes are recorded by Michon.[313] Torsion is usually unilateral.

Martinolli[314] noted that when the hypophysis was inactivated the motility of the tubes became markedly increased.

Hannes[315] gives the following conditions and indications for sterilization: cases in which another pregnancy is absolutely contraindicated; cases where sterilization accompanies a therapeutic abortion; and vaginal plastic operations like the Wertheim operation for prolapse. Haskin's[316] technic for sterilization consists in ligating the tube 1½ cm. from the uterus with excision of the tube between the uterine horn and the point of ligation. The ligated end of the tube is sewed into the abdominal wall. (It appears that this procedure could lead to intestinal obstruction.)

In a study of postoperative changes in the libido, Vruwink and Popence[317] found that bilateral salpingectomy had no effect on the patients' sexual phase. The psychologic effect of sterilization appeared to benefit sexually one-third of the sterilized patients who previously feared pregnancy.

OVARY

There is a type of severe uterine hemorrhage in which no pelvic cause can be discovered, and in which presumably there exists a constitutional factor due to disordered calcium metabolism.[318] In diseases of the thyroid there occurs a disturbance of the uterine rhythm which Scibelli[319] ascribes to the thyroid and folliculin regulators. When vitamin E was absent in the diet of his experimental animals, Rio[320] found an atrophy of the endometrium. Falconis and Chiapponi[321] observed that injection of spermatozoa caused a momentary inhibition of the external secretory functions of the ovary. Carloni[322] injected "folliculin" extracts and noted phenomena of hypotension and vasodilatation in the capillaries of the skin. According to Cordua[323] the injection of one c.c. of serum of pregnant women caused growth of the uterus. Esch[324] injected 10 c.c. of blood of pregnant women intragluteally at stated intervals in cases of amenorrhea with hypoplastic genitals and obtained striking clinical results. Zamkoff[325] injected urine of pregnant women for amenorrhea without seeing toxic effects.

Caudela[326] reports the results of a series of experiments with follicular, luteinic and mammary extracts, and notes that follicular extracts accentuate the development of the genital tract, the maturation of the follicles, and intensify the estrous cycle. The injection of mammary and luteinic extracts causes alterations in the menstrual cycle. Momoglioano[327] believes that the secretion of the corpus luteum is a colloid rather than a lipoid. Mahnert[328] is of the opinion that the corpus luteum hormone influences the growth of the follicle indirectly and acts antagonistically to the hypophysis. In studies of the reaction of the uterine musculature during the menstrual cycle, Siegmund[329]

found a difference in sensitiveness to pituitrin in the musculature of uteri of the rat and rabbit. This may account for the apparent conflicting reports of the action of similar hormones in different mammals.

Conclusions from the studies of Fels[330] appear to indicate that the placenta not only acts as a storehouse but also produces the anterior pituitary and the female sex hormone. Morrell, Powers and Varley[331] report that the follicular hormone is present in large amounts in the amniotic and allantoic fluids of cattle. Frank and Goldberger[332] found a lower renal threshold for the female sex hormone in cases of amenorrhea and functional sterility. Campbell and Collip[333] reported that the oral administration of the ovary-stimulating hormone of the placenta gave clinical results in five cases of oligomenorrhea, two with menopausal symptoms, and in two cases of dysmenorrhea. Gabrielianz[334] gives an excellent review of the endocrines in gynecology with a tabulation of 56 cases. There was an improvement in 44; partial improvement in 4; and failure in 7 cases.

Dahlberg[335] is of the opinion that the mechanism of uni-ovulation is controlled by an inhibiting hormone, ovein, which is secreted in the follicular fluid, and in the corpus luteum of menstruation and pregnancy. Gilardino[336] noted a distinct hyperemia and hypertrophy of the thyroid following the subcutaneous injection of follicular extracts. Bisceglie[337] found that the hypophysis showed hyperemia, a constant increase in acidophiles, and a disappearance of the basophilic cells with the injection of follicular liquid. In the thyroid he found a gradual reduction of the volume of the thyroid cells, and a smaller amount of colloid material. Manzi[338] states that large doses of folliculin produce a hypersecretion of the granulosa cells. (In the light of our present knowledge of the female sex hormone it cannot be surprising that many and varied conclusions about this substance are expressed in current publications.)

In a discussion of the ovarian hormones it becomes necessary to include references to the pituitary. In addition to their effect on the mammary glands, the kidneys (vasodilatation), and on growth, hypophyseal hormones produce three distinct effects: ovulation, luteinization of the follicle, and activation of the ovarian hormone (corpus luteum). The hormone of the corpus luteum causes characteristic changes of the premenstrual phase and decidual transformation in cases of gestation. For these reasons, Fluhmann[339] points out, it becomes necessary to consider pelvic diseases from a "functional" standpoint. In a study of 319 patients, he finds that the pituitary hormone is increased during pregnancy, in the early stages of the menopause with irregular profuse periods, in a small number of young women with too frequent menses (menorrhagia), and in cases of severe dysmenorrhea. The test in this group showed an "ovulation" reaction.

Zondek[340, 341, 342, 343] states that the anterior lobe of the pituitary produces two substances, the follicle-ripening hormone which he designated as Prolan A and the lutein-ripening hormone Prolan B. Each of these substances mobilizes an hormone in the ovary, the one, formed in the follicle, is termed Follikulin and causes growth of the uterine mucosa up to the beginning of the pregravid phase. The other, produced in the corpus luteum, is designated Lutein and causes the

secretory phase. Menstruation depends upon a balance of folliculin and lutein. Zondek[344] reports that the test for Prolan A is positive in 81 per cent of cases of carcinoma of the female genitalia. In healthy women this reaction is never positive and in benign tumors of the genitals positive in 25 per cent of the cases.

Philipp[345, 346] finds that in early pregnancy the placenta contains a large amount of "anterior lobe hormone." Prolan B is produced in the placenta.[347]

In the study of these hormones it is essential to have the substances in pure form. The female sex hormone has been isolated in pure crystalline form by Doisy, Veler, Thayer[348] and Gustavson in this country, and by Butenaudt in Germany. Zondek and Van Eweyk[349] found that the female sex hormone was most easily obtained by precipitating it from the urine with salts of the heavy metals. Gustavson, Schochet, Lackner and Saunders[350] employ a pump extraction method in their preparation of the female sex hormone.

A very ingenious method has been devised by Newell, Allen and Pratt[351] for the recovery of human ova from the tube. The authors conclude from their study that ovulation occurs between the twelfth and fourteenth day following the onset of the previous menses.

Stuckert[352] divides the ovarian hemorrhages into two groups, continuous bleeding from a ruptured graafian follicle and from a ruptured corpus luteum cyst. According to Greenhill[353] there are only 73 cases of rupture of the corpus luteum recorded in the literature. Since then Mathieu and Holman,[354] and Acken[355] have cited additional observations. King[356] discusses the similarity of certain luteal cysts with endometriosis. (It is evident that not all cases of ruptured corpus luteum cysts have been recorded in the literature.)

C. Jeff Miller[357] presents a very interesting and vivid outline of the historical development of surgery of uterine and ovarian tumors. Credit is due to Ephraim McDowell as the first surgeon and gynecologist to remove an ovarian tumor. (This excellent treatise should be read by every student of gynecology.)

There are comparatively few cases of torsion of solid tumors of the ovary reported. Vitali[358] describes the few symptoms that may be associated with this condition. In one case, cited by Fuchs,[359] the fibroadenoma became separated from the ovary and was attached to the liver.

Mason and Hamrick[360] review the causes of operative mortality in pseudomyxoma peritonei of ovarian origin chiefly due to pulmonary embolism and general peritonitis. Roentgen-ray or radium therapy is advocated in all cases.

Granulosa-cell tumors of the ovary appear to arise from embryonic rests of the ovarian parenchyma in the medullary portion of the ovary. TeLinde[361] reports three instances of such tumors, and one of the closely related oophoroma follicular group. Clinically these tumors occur most frequently after the cessation of the menses. Babes and Pantz-Lazarescu[362] believe that Krukenberg tumors arise from the differentiated and the undifferentiated mucinous cells forming adenocarcinoma located beneath the peritoneal surface of the stomach, ovary, spleen, and liver.

The typical teratoma is formed of derivatives from all three germ layers and their teratogenic period must be attributed to a very early

phase in the ontogenetic development. Bjorkenheim[363] gives a detailed description of a teratoma in a young woman of twenty-one years in which the tumor mass was found in the culdesac of Douglas. Robert Meyer[364, 365] describes six cases of typical tubular adenomas (testicular) of the ovary. Meyer has designated these tumors as "andreioblastomata" because the cells of the tumors are probably due to the effect of an internal secretion of the male elements.

REFERENCES

(100) J. A. M. A. **95:** 1221, 1930. (101) J. A. M. A. **94:** 834, 1930. (102) J. A. M. A. **94:** 833, 1930. (103) Am. J. Obst. & Gynec. **19:** 511, 1930. (104) Brit. M. J. **11:** 201, 1930. (105) J. A. M. A. **95:** 1222, 1930. (106) Am. J. Obst. & Gynec. **19:** 167, 1930. (107) Am. J. Obst. & Gynec. **20:** 500, 1930. (108) Am. J. Obst. & Gynec. **20:** 15, 1930. (109) Arch. di biol. norm. e path. 1930. (110) Zentralbl. f. Gynäk. **54:** 1748, 1930. (111) Minnesota Med. **42:** 172, 1930. (112) Colorado Med. **27:** 127, 1930. (113) J. A. M. A. **95:** 1148, 1930. (114) Am. J. Obst. & Gynec. **19:** 179, 1930. (115) J. A. M. A. **95:** 1796, 1930. (116) Am. J. Obst. & Gynec. **20:** 633, 1930. (117) Am. J. Roentgenol. **24:** 267, 1930. (118) Radiol. Rev. & Chicago M. Rec. **52:** 128, 1930. (119) J. Obst. & Gynec. Brit. Emp. **38:** 233, 1930. (120) Med. Klin. **26:** 1, 1930. (121) J. A. M. A. **95:** 13, 1930. (122) Am. J. Obst. & Gynec. **20:** 310, 1930. (123) Monatschr. f. Geburtsh. u. Gynäk. **84:** 241, 1930. (124) Johns Hopkins Hosp. Bull. **47:** 22, 1930. (125) Monatschr. f. Geburtsh. u. Gynäk. **86:** 31, 1930. (126) Southern M. J. **23:** 571, 1930. (127) J. A. M. A. **94:** 155, 1930. (128) Monatschr. f. Geburtsh. u. Gynäk. **84:** 319, 1930. (129) Zentralbl. f. Gynäk. **54:** 2208, 1930. (130) Zentralbl. f. Gynäk. **54:** 2208, 1930. (131) Acta obst. et gynec. Scandinav. **10:** 111, 1930. (132) Am. J. Obst. & Gynec. **20:** 699, 1930. (133) Ann. ostet. e ginec. **52:** 423, 1930. (134) Arch. ital. di ginec. **11:** 1930. (135) Am. J. Obst. & Gynec. **19:** 367, 1930. (136) Ztschr. f. Geburtsh. u. Gynäk. **97:** 299, 1930. (137) Am. J. Obst. & Gynec. **19:** 246, 1930. (138) Zentralbl. f. Gynäk. **54:** 104, 1930. (139) Schweizer. med. Wchnschr. **60:** 381, 1930. (140) J. A. M. A. **94:** 601, 1930. (141) Arch. f. Gynäk. **142:** 120, 1930. (142) Surg. Gynec. Obst. **50:** 644, 1930. (143) Surg. Gynec. Obst. **51:** 491, 1930. (144) Am. J. Obst. & Gynec. **20:** 51, 1930. (145) Virginia Med. Month. **57:** 11, 1930. (146) Zentralbl. f. Gynäk. **54:** 113, 1930. (147) Zentralbl. f. Gynäk. **54:** 542, 1930. (148) Zentralbl. f. Gynäk. **54:** 2626, 1930. (149) Zentralbl. f. Gynäk. **54:** 773, 1930. (150) Bull. Soc. franç. de dermat. et syph. **37:** 123, 1930. (151) Surg. Gynec. Obst. **51:** 856, 1930. (152) Am. J. Obst. & Gynec. **20:** 103, 1930. (153) Surg. Gynec. Obst. **50:** 990, 1930. (154) Zentralbl. f. Gynäk. **54:** 2824, 1930. (155) Jap. J. Obst. & Gynec. **13:** 115, 1930. (156) Arch. ostet. et ginec. **17:** 198, 1930. (157) Zentralbl. f. Gynäk. **54:** 514, 1930. (158) Ztschr. f. Gynäk. **98:** 444, 1930. (159) Am. J. Obst. & Gynec. **19:** 641, 1930. (160) Western J. Surg. **38:** 504, 1930. (161) J. A. M. A. **95:** 1413, 1930. (162) Am. J. Obst. & Gynec. **19:** 839, 1930. (163) Brit. M. J. **1:** 577, 1930. (164) Am. J. Obst. & Gynec. **19:** 822, 1930. (165) Bol. Soc. de obst. y ginec. de Buenos Aires **9:** 124, 1930. (166) Med. J. Australia **1:** 356, 1930. (167) Am. J. Obst. & Gynec. **19:** 548, 1930. (168) N. Y. State J. Med. **30:** 887, 1930. (169) Zentralbl. f. Gynäk. **54:** 2114, 1930. (170) Ztschr. f. Geburtsh. u. Gynäk. **98:** 526, 1930. (171) Zentralbl. f. Gynäk. **54:** 962, 1930. (172) Ztschr. f. Geburtsh. u. Gynäk. **97:** 312, 1930. (173) Zentralbl. f. Gynäk. **54:** 1827, 1930. (174) Ztschr. f. Geburtsh. u. Gynäk. **97:** 351, 1930. (175) Kazansky Med. J. **26:** 690, 1930. (176) Med. Klin. **45:** 1930. (177) J. Obst. & Gynec., Brit. Emp. **37:** 72, 1930. (178) J. Obst. & Gynec. Brit. Emp. **37:** 1, 1930. (179) Am. J. Obst. & Gynec. **19:** 185, 1930. (180) Surg. Gynec. Obst. **50:** 741, 1930. (181) Zentralbl. f. Gynäk. **54:** 2702, 1930. (182) Am. J. Obst. & Gynec. **19:** 779, 1930. (183) Surg. Gynec. Obst. **50:** 599, 1930. (184) Zentralbl. f. Gynäk. **54:** 2135, 1930. (185) J. A. M. A. **94:** 983, 1930. (186) J. A. M. A. **95:** 153, 1930. (187) Am. J. Obst. & Gynec. **19:** 633, 1930. (188) J. A. M. A. **95:** 1563, 1930. (189) Arch. Surg. **20:** 637, 1930. (190) Monatschr. f. Geburtsh. u. Gynäk. **86:** 197, 1930. (191) Edit. Surg. Gynec. Obst. **51:** 561, 1930. (192) Surg. Gynec. Obst. **50:** 688, 1930. (193) Edit. J. A. M. A. **94:** 870, 1930. (194) J. Path. & Bact. **33:** 119, 1930. (195) Arch. di ostet. e ginec. **16:** 547, 1929. (196) J. A. M. A. **94:** 625, 1930. (197) Edit. Surg. Gynec. Obst. **51:** 262, 1930. (198) Edit. J. A. M. A. **95:** 1350, 1930. (199) Am. J. Obst. & Gynec. **19:** 210, 1930. (200) Am. J. Obst. & Gynec. 19: 520, 1930. (201) Monatschr. f. Geburtsh. u. Gynäk. **86:** 58, 1930. (202) Arch. di ostet. e ginec. **17:** 1, 1930. (203) Zentralbl. f. Gynäk. **54:** 1986, 1930. (204) Surg. Gynec.

Obst. **51**: 133, 1930. (205) München. med. Wchnschr. **70**: 97, 1930. (206) New England J. Med. **202**: 1, 1930. (207) J. A. M. A. **95**: 1985, 1930. (208) Klin. Wchnschr. **32**: 1507, 1930. (209) Surg. Gynec. Obst. **50**: 200, 1930. (210) Arch. di ostet. **17**: No. 8, 1930. (211) Am. J. Obst. & Gynec. **19**: 654, 1930. (212) Ann. di ostet. e. ginec. **52**: 261, 1930. (213) Am. J. Obst. & Gynec. **20**: 66, 1930. (214) J. A. M. A. **95**: 1602, 1930. (215) Surg. Gynec. Obst. **51**: 125, 1930. (216) Am. J. Obst. & Gynec. **20**: 571, 1930. (217) Surg. Gynec. Obst. **51**: 683, 1930. (218) Am. J. Obst. & Gynec. **19**: 285, 1930. (219) Surg. Gynec. Obst. **51**: 321, 1930. (220) J. A. M. A. **95**: 1097, 1930. (221) Surg. Gynec. Obst. **51**: 500, 1930. (222) Gynéc. et obst. **26**: 2, 1930. (223) Am. J. Obst. & Gynec. **20**: 481, 1930. (224) Am. J. Obst. & Gynec. **20**: 670, 1930. (225) Ztschr. f. Geburtsh. u. Gynäk. **96**: 516, 1930. (226) Am. J. Obst. & Gynec. **19**: 335, 1930. (227) Zentralbl. f. Gynäk. **54**: 578, 1930. (228) Zentralbl. f. Gynäk. **54**: 1538, 1930. (229) Zentralbl. f. Gynäk. **54**: 1542, 1930. (230) J. Lab. & Clin. Med. **16**: 27, 1930. (231) Am. J. Obst. & Gynec. **20**: 595, 1930. (232) Deutsche med. Wchnschr. No. 33, 1930. (233) Ann. Surg. **91**: 841, 1930. (234) Bordeaux Chir. **1**: 1, 1930. (235) Lancet **218**: 277, 1930. (236) Surg. Gynec. Obst. **50**: 173, 1930. (237) Am. J. Obst. & Gynec. **19**: 457, 1930. (238) Clin. Ostet. 653, 1929. (239) Zentralbl. f. Gynäk. **54**: 1357, 1930. (240) Radiol. Med. **17**: 809, 1930. (241) Bull. Soc. di obst. et. Gynec. **19**: 159, 1930. (242) Surg. Gynec. Obst. **50**: 110, 1930. (243) Strahlentherapie **36**: 403, 1930. (244) Am. J. Roentgenol. **21**: 54, 1930. (245) New Eng. J. Med. **203**: 247, 1930. (246) Am. J. Roentgenol. **24**: 412, 1930. (247) Am. J. Obst. & Gynec. 1930. (248) Med. Klin. **26**: 699, 1930. (249) Radiology **14**: 211, 1930. (250) Am. J. Obst. & Gynec. **20**: 443, 1930. (251) Am. J. Obst. & Gynec. **20**: 519, 1930. (252) Ann. di obst. **52**: 309, 1930. (253) Ann. di obst. **12**: 146, 1930. (254) Ztschr. f. Geburtsh. u. Gynäk. **98**: 193, 1930. (255) J. A. M. A. **95**: 1164, 1930. (256) München. med. Wchnschr. **34**: 1456, 1930. (257) München. med. Wchnschr. **29**: 1240, 1930. (258) J. A. M. A. **94**: 489, 1930. (259) Ugeskrift for Laeger, Copenhagen **92**: 837, 1930. (260) Surg. Gynec. Obst. **50**: 873, 1930. (261) Therapie der Gegenwart **71**: 452, 1930. (262) Arch. f. Gynäk. **141**: 125, 1930. (263) Trans. Soc. Exper. Biol. In Press. (264) Am. J. Obst. & Gynec. **20**: 355, 1930. (265) Am. J. Obst. & Gynec. **20**: 129, 1930. (266) J. A. M. A. **95**: 1557, 1930. (267) Boletin de la Soc. de Obst. y Ginec. de Buenos Aires **9**: 245, 1930. (268) Rev. Franç. de Gynéc. et d'Obst., Paris **25**: 81, 1930. (269) L'Ospedale Maggiore di Novara **8**: 760, 1930. (270) J. A. M. A. **94**: 255, 1930. (271) J. A. M. A. **95**: 1219, 1930. (272) J. A. M. A. **94**: 489, 1930. (273) München. med. Wchnschr. **77**: 225, 1930. (274) J. A. M. A. **94**: 1204, 1930. (275) Am. J. Obst. & Gynec. **19**: 739, 1930. (276) Brit. M. J. **1**: 629, 1930. (277) J. A. M. A. **94**: 1615, 1930. (278) Fortschr. der Therap. **6**: 458, 1930. (279) J. A. M. A. **95**: 468, 1930. (280) Am. J. Obst. & Gynec. **19**: 77, 1930. (281) Am. J. Obst. & Gynec. **19**: 530, 1930. (282) J. Obst. & Gynec. Brit. Emp. **37**: 256, 1930. (283) J. A. M. A. **94**: 478, 1930. (284) Arch. f. Gynäk. **142**: 514, 1930. (285) Surg. Gynec. Obst. **51**: 55, 1930. (286) Rev. franç. de gynec. et d'obst. **25**: 159, 1930. (287) Proc. Soc. Exper. Biol. & Med. **27**: 857, 1930. (288) Am. J. Roentgenol. **23**: 125, 1930. (289) Zentralbl. f. Gynäk. **54**: 3013, 1930. (290) J. A. M. A. **95**: 1652, 1930. (291) J. A. M. A. **95**: 1647, 1930. (292) Zentralbl. f. Gynäk. **54**: 2183, 1930. (293) Am. J. Obst. & Gynec. **20**: 28, 1930. (294) Surg. Gynec. Obst. **50**: 663, 1930. (295) Acta obst. et gynec. Scandinav. **10**: Suppl. 1930. (296) J. A. M. A. **94**: 1221, 1930. (297) Northwest Med. **29**: 460, 1930. (298) Am. J. Obst. & Gynec. **19**: 381, 1930. (299) Am. J. Obst. & Gynec. **19**: 87, 1930. (300) Zentralbl. f. Gynäk. **54**: 1025, 1930. (301) Arch. di ostet. e ginec. **17**: 536, 1930. (302) Missouri M. A. **27**: 327, 1930. (303) Am. J. Obst. & Gynec. **20**: 582, 1930. (304) Surg. Gynec. Obst. **51**: 125, 1930. (305) Acta obst. et gynec. Scandinav. **10**: 1, 1930. (306) Am. Rev. Tuberc. **22**: 1, 1930. (307) Am. J. Obst. & Gynec. **19**: 430, 1930. (308) Fortschr. der Therap. **6**: 1930. (309) Am. J. Obst. & Gynec. **20**: 81, 1930. (310) J. Obst. & Gynec. Brit. Emp. **37**: 96, 1930. (311) Arch. ital. di chir. **25**: 395, 1930. (312) Arch. ostet. e ginec. **17**: 294, 1930. (313) Gynéc. et obst. **21**: 103, 1930. (314) Folia Gynaec. **27**: 13, 1930. (315) Klin. Wchnschr. **8**: 351, 1930. (316) Zentralbl. f. Gynäk. **54**: 94, 1930. (317) Am. J. Obst. & Gynec. **19**: 72, 1930. (318) Brit. M. J. **1**: 1164, 1930. (319) Arch. di ostet. e ginec. **16**: 1008, 1929. (320) Arch. di ostet. e ginec. **16**: 711, 1929. (321) Rev. franç. de gynée d'obst. **25**: 441, 1930. (322) Arch. ostet. e ginec. **17**: 327, 1930. (323) Zentralbl. f. Gynäk. **54**: 211, 1930. (324) Zentralbl. f. Gynäk. **54**: 19, 1930. (325) Gynec. et ostet. **21**: 439, 1930. (326) Arch. di ostet. e ginec. **17**: 97, 1930. (327) Arch. di ostet. e ginec. **17**: 409, 1930. (328) Zentralbl. f. Gynäk. **54**: 2883, 1930. (329) Arch. f. Gynäk. **140**: 573, 1930. (330) Zentralbl. f. Gynäk. **54**: 2191, 1930. (331) Endocrinology

14: 28, 1930. (332) J. A. M. A. **94:** 1197, 1930. (333) Canad. M. A. J. **22:** 219, 1930. (334) Illinois M. J. 1930. (335) Acta obst. et gynec. Scandinav. **10:** 63, 1930. (336) Riv. ital. ginec. **11:** 1930. (337) Endocrinol. e patol. costit. **5:** 70, 1930. (338) Arch. di ostet. e ginec. **17:** 253, 1930. (339) Am. J. Obst. & Gynec. **20:** 1, 1930. (340) Zentralbl. f. Gynäk. **54:** 1, 1930. (341) Klin. Wchnschr. **9:** 245, 1930. (342) Deutsche med. Wchnschr. **56:** 300, 1930. (343) Klin. Wchnschr. **9:** 393, 1930. (344) Klin. Wchnschr. **9:** 679, 1930. (345) Zentralbl. f. Gynäk. **54:** 450, 1930. (346) Zentralbl. f. Gynäk. **54:** 1858, 1930. (347) Zentralbl. f. Gynäk. **49:** 3076, 1930. (348) Edit. J. A. M. A. **94:** 341, 1930. (349) Klin. Wchnschr. **9:** 1436, 1930. (350) (In press.) (351) Am. J. Obst. & Gynec. **19:** 180, 1930. (352) J. A. M. A. **94:** 1227, 1930. (353) Am. J. Obst. & Gynec. **19:** 423, 1930. (354) Western J. Surg. 1930. (335) Am. J. Obst. & Gynec. **20:** 860, 1930. (356) Surg. Gynec. Obst. **50:** 1, 1930. (357) J. Tenn. State M. A. **23:** 201, 1930. (358) Ann. obstet. e ginec. **52:** 364, 1930. (359) Zentralbl. f. Gynäk. **54:** 2696, 1930. (360) Surg. Clin. North America **10:** 61, 1930. (361) Am. J. Obst. & Gynec. **20:** 552, 1930. (362) Gynec. et obstet. **21:** 465, 1930. (363) Acta obst. et gynec. Scandinav. **10:** 163, 1930. (364) Zentralbl. f. Gynäk. **54:** 3744, 1930. (365) Beitr. z. Path. Anat. u. a. allg. Path. **84:** 485, 1930.

Correspondence

To the Editor.—A paper read by Dr. J. A. Calkins before the Norfolk County Medical Society in 1926, drew my attention to the use of bromides in large and systematic doses in the treatment of severe nausea of pregnancy.

DeLee's *Obstetrics*, 4th edition, 1924, briefly mentions bromide in 1-dram doses by rectum. The previous edition mentioned 30-grain doses which seems to be the prevailing practice today. I am aware that bromide is a time-honored remedy for this condition, but usually it has been used in insufficient dosage, and the results have not been marked.

During the past decade a number of papers have been published on the subject, many mentioning bromide but not emphasizing dosage. The plan which I have followed is 1 dram of bromide per rectum every six hours night and day until nausea is controlled, usually twenty-four to forty-eight hours, then reducing the dose and frequency as indicated. If acidosis is present glucose is given intravenously, saline by hypodermoclysis, and food as soon as it can be taken, which is usually about twenty-four hours. Other hygienic, dietary, and gynecologic methods are of course used as indicated. The early cases with less severe nausea are given 20 grains of bromide every six hours by mouth and decreased as the bromide level in the blood rises sufficiently to control symptoms.

Unfortunately bromide psychosis and dermatosis may appear in some of the more prolonged cases. During 1927, Otto Wuth of the Johns Hopkins Hospital (*J. A. M. A.*, **88:** 2013), devised a method of quantitative detection of bromide in the blood. This gave a gauge by which we could determine the effect of the dose and anticipate danger. The best results appear after the accumulation of 100 or 150 mg. to 100 c.c. of blood, and more than 200 mg. has been found to give symptoms.

It has been shown that bromides in part replace the chlorides in the blood, and that sodium chloride given intravenously or by mouth relieves the excessive bromide retention. This work (except possibly the application of Wuth's work to an obstetric problem) did not originate with me, but these simple methods have been so extremely helpful in this troublesome condition that I take the liberty of calling your attention to it with the hope that you may have the opportunity of passing it on to your readers in some way.

C. J. Andrews, M.D.

Norfolk, Va.

AM. J. OBST. & GYNEC.
OCTOBER, 1931, P. 513.

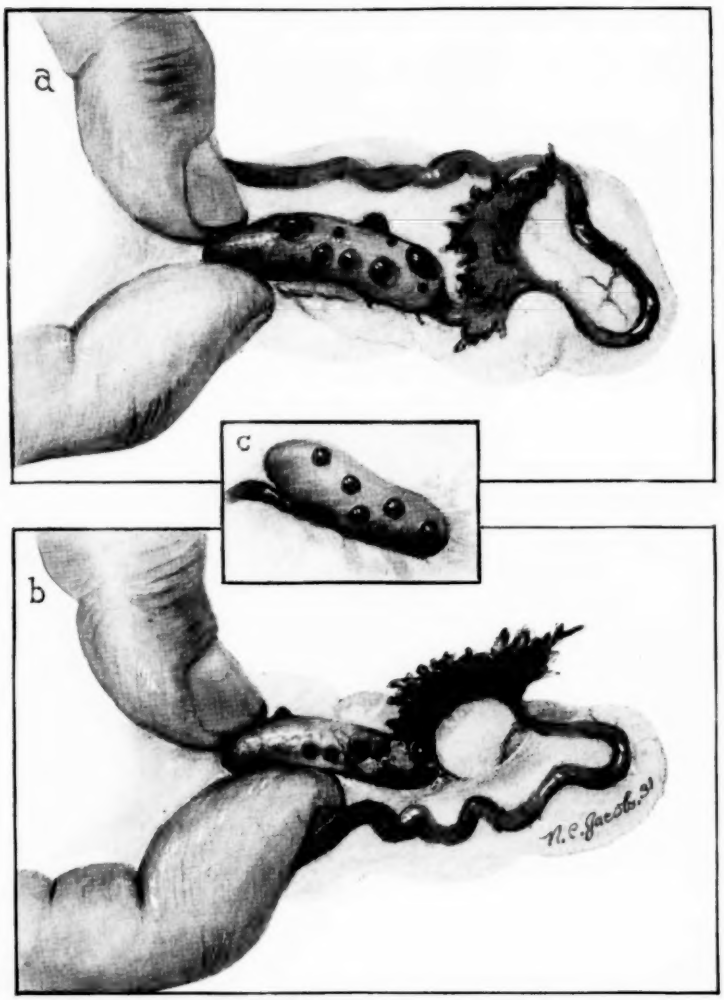


Plate I.—Rabbit ovulation test.

a. Rabbit's ovary showing unruptured follicles and old dark hemorrhagic, unruptured follicles, a negative reaction.

b. Recently ruptured follicles, bright red, conical or umbilicated elevations, a positive reaction.

c. Ovary with unruptured follicles, a negative reaction.